~~SU~~ L. SO.D

LSHTM
0011273418

Mitchell Wilson

205, 6

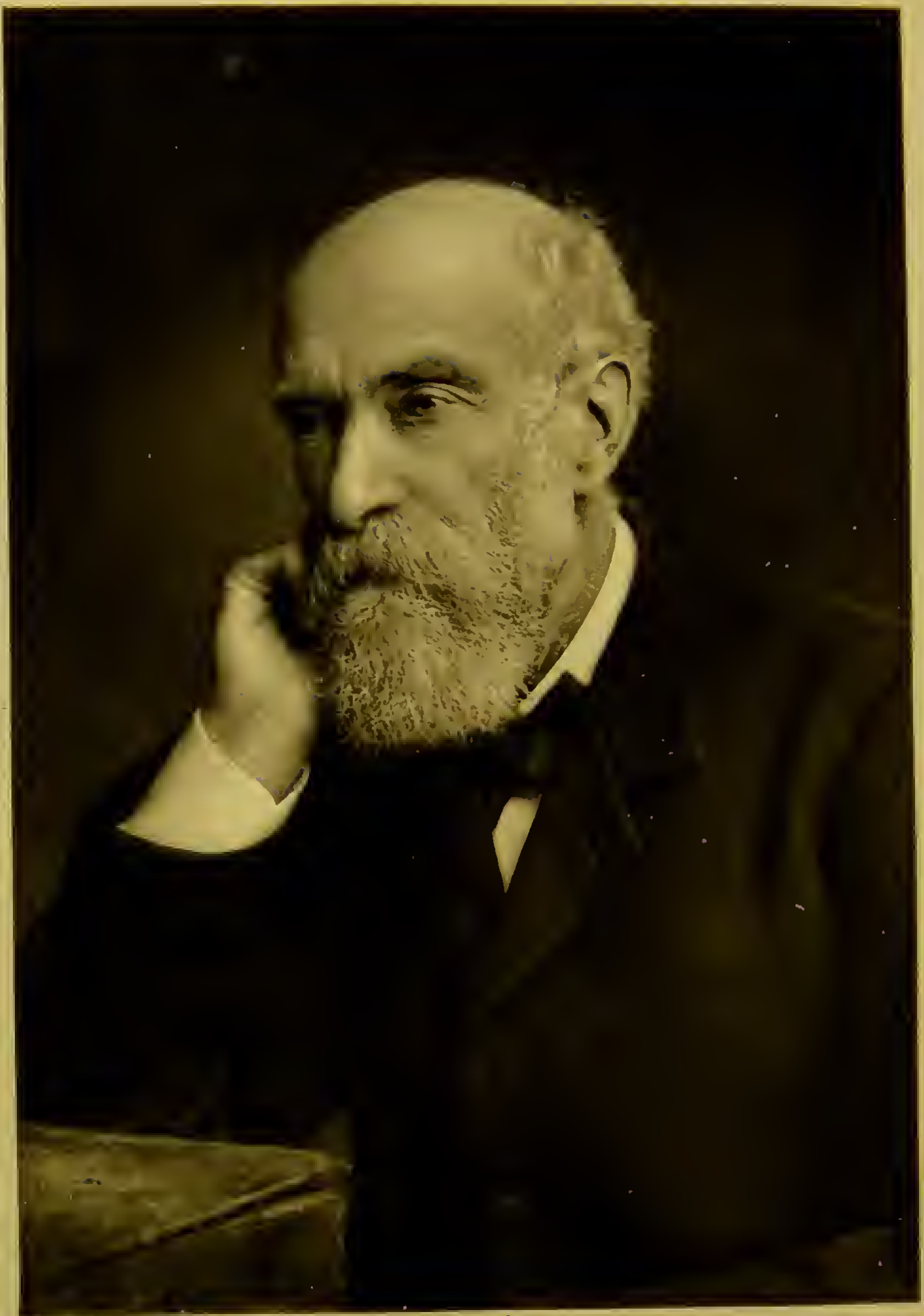
357 [illegible]
24 [illegible] of health [illegible]

PUBLIC HEALTH ADMINISTRATION IN GLASGOW

PUBLISHED BY
JAMES MACLEHOSE AND SONS, GLASGOW
Publishers to the University.

MACMILLAN AND CO., LTD., LONDON.
New York, - - *The Macmillan Co.*
London, - - - *Simpkin, Hamilton and Co.*
Cambridge, - - *Macmillan and Bowes.*
Edinburgh, - - *Douglas and Foulis.*

MCMV.



Photogravure by T. & R. Annan & Sons.

Yours very truly
J. B. Russell

PUBLIC HEALTH ADMINISTRATION IN GLASGOW

A MEMORIAL VOLUME OF THE WRITINGS OF

JAMES BURN RUSSELL
B.A., M.D., LL.D.
MEDICAL MEMBER OF THE LOCAL GOVERNMENT BOARD FOR SCOTLAND
AND FORMERLY MEDICAL OFFICER OF HEALTH FOR GLASGOW

EDITED BY
A. K. CHALMERS, M.D.
MEDICAL OFFICER OF HEALTH FOR GLASGOW

GLASGOW
JAMES MACLEHOSE AND SONS
PUBLISHERS TO THE UNIVERSITY
1905

5903

GLASGOW: PRINTED AT THE UNIVERSITY PRESS
BY ROBERT MACLEHOSE AND CO. LTD.

PREFACE

BY SIR WILLIAM T. GAIRDNER, K.C.B.

Having been asked to contribute an introduction to the volume of Memoirs herewith presented, I do so with the more satisfaction because not only did the suggestion of gathering these papers together in a volume originate with me, but there is no man living who, from his close association with Dr. Russell, is more in a position to view his sanitary work as a whole, and to state in a few words the principles which underlay it, and the ideals at which he aimed.

Having been for nearly ten years, 1863 to 1872, Chief Medical Officer to the City of Glasgow, and having been the means, indirectly, of introducing Dr. Russell to that position, I have always declared that the chief service that I was enabled to do for the City was to have discovered Dr. Russell, and placed him in the track of my succession. I trust, indeed I am confident, that the material provided in the present volume will completely bear out what is here said, and will show that in clearness of insight, steadiness of aim, and the conciliatory temper which alone could achieve success in such an enterprise, Dr. Russell presents a model for all future sanitary officials.

The Memoirs here printed fall into several groups, of which it is not necessary to say more than that, though not in strict chronological sequence, they are easily distinguishable by their object and character.

It is not necessary to enlarge upon the first group relating to his services as Physician to the Fever Hospital further than that it displays the same qualities of originality (as most of the Hospitals were constructed entirely under his superintendence) and successful resource as do all the rest. When he came in 1872 to the full position of Sanitary Officer, I think he must very soon have become persuaded that although (as it is commonly said) it is "not possible to make men moral by Act of Parliament," yet as regards the external conditions of their life, their environment (to use a modern phrase) it is almost all-important, and at all events it is very possible so to guide both legislation and the ideals of public service, as to an almost indefinite extent to influence the habits of great numbers of men. This is not, however, to be done in a hurry, or even at all by mere official regulations. Glasgow, at the time I took office in 1863, was perhaps the most aggravated instance in the whole country of evil habits growing out of centuries of deficient control, which had practically created a large and increasing body of citizens living in conditions that were absolutely inconsistent with anything like reasonably good sanitation, not to speak of good morals. It was Dr. Russell's privilege to realise early in his career that there was no other mode of dealing with these complicated evils than what he usually termed "pegging away," *i.e.* dealing with individual instances of intolerable neglect in the light of large general principles which could be explained so as to make the individual instances a lesson all round; not only to the miserable victims of past carelessness and civic unwisdom, but to landlords, factors, tenants and everyone concerned in the miseries thus arising. It was under the influence of these ideals that such educative, and at the same time picturesque papers as "Life in One Room," "Uninhabitable Houses," "The Children of the City," took their origin, as will appear clearly to the reader of this volume.

The Glasgow City Improvement Act, which was passed in 1866, without much difficulty or opposition in the House of Commons, was greatly retarded by local consideration, so that it can hardly be said to have come into practical operation until Dr. Russell took up the control in 1872. The study, therefore, of the effects of this Act from the very beginning, came under his official cognizance, and is the subject of more than one of the Papers here presented. Dr. Russell was much more than a statistician, or a mere dealer with accomplished facts; nevertheless, I believe that the Papers devoted to this subject constitute an absolutely unique disclosure, both as to the results, and the processes, of dealing with the displacement, under Acts of Parliament, of large masses of population especially of the poorest and most ignorant classes.

One of the conclusions reached and expounded by Dr. Russell, which although obvious enough to all who have carefully studied the various Commissions on the Health of Towns, etc., from the time of Chadwick, Arnott, and Lyon Playfair onwards, is that gross sanitary neglect inevitably tends to the production and multiplication of a class which is not only helpless and progressively in a state of degradation from generation to generation, but has in itself no power of redemption, so that as regards the community at large, it becomes a truly *parasitic* class, living upon the classes above it, in such hovels as are provided for it, and absolutely precluded from every kind of spontaneous improvement, and therefore bound to become worse and worse with each generation. This was the class in Glasgow which had assumed such formidable proportions in 1863 when I took office, in the midst of a rising epidemic of typhus fever, and it was in dealing with this class that I was led to say at the time, that all our efforts, as then possible under the Glasgow Police Act of 1862, were merely "scratching the surface," and that much more decisive legislation would be required before any permanent impression could be made on the causes not only of typhus fever, but of other epidemics, and even of some diseases not commonly considered epidemic, such as tuberculosis. It is well known how much good has been done in this direction under Dr. Russell's supervision, and it will be seen, I think, that the Glasgow Improvement Act has been a very considerable factor in this social amendment.

Another evil with which Glasgow and all great industrial centres have to contend, and which is perhaps even now far from adequately met in our great cities, is the migration into them of large numbers who, while they lived in the country, and were occupied with rural work, had at all events some reasonable prospects of retaining average health, but when enclosed in towns, and induced by the prospects of better wages to take to different occupations, were extremely apt to sink into hopeless poverty and irredeemable neglect of all the conditions of moderately good sanitation.

I remember very vividly a visit which I paid during the time of my official work to a great lady in the Highlands, who is still alive, but who, I fear, will never be able to read these lines, so as to confirm what is here set down. This excellent lady had devoted herself for many years to the improvement of what I ventured to call the "Happy Valley," one of those running down from the north-west towards the Caledonian Canal. She knew almost every family within her own great domain; encouraged them in every way as regards keeping their houses in order, and, in fact, became a far-reaching, good influence that was extremely evident, even to a casual visitor. I remarked to her one day that according to my experience of human nature there would always be a certain number of people who, either from intemperance, or hereditary idleness and inattention, would not be won over to become fitting inhabitants for the "Happy Valley," and "what, I ask, will become of such people?" "Oh," she replied, "I suppose they find their way to Fort William." Yes, I reflected, perhaps without expressing it, "and perhaps if they do not find themselves well suited there, they may find their way to Glasgow."

It has always been my conviction as a Sanitarian that our great towns need to be furnished with means of protection against the immigration of undesirable persons of this kind, and that it would be in the end a really beneficent rule that would make the permanent residence of what may be called a parasitic class *impossible*, either in town or country. It was difficult to express such opinions unguardedly under the pressure of official responsibility, but the Memoirs published in this volume will, I think, tend to press home such convictions on every attentive reader.

CONTENTS.

PAGE

Portrait of Dr. Russell, - - - - - - - *Frontispiece*

Preface by Sir William T. Gairdner, K.C.B., - - v

Biographical Note by the Editor, - - - - - - xiii

List of Published Papers, - - - - - - - - xxix

CHAPTER I.

The First Half of the Century, a Period of Awakening.

Industrial expansion and some of its evils: Public apathy to the resulting conditions broken by the enquiries of the Poor Law Commissioners: The Condition of Glasgow prior to the clearances under the Police Act, 1843: The Town Council resolves to acquire tenements in worst districts (1846): Formation of Model Lodging-Houses Association: Early effort at reform by Dean of Guild Court (1848): Need for a Building Act recognised: Early methods of dealing with Infectious Diseases: Board of Health formed: Water Works Act (1855): Differentiation of Public Health as a function of Government: Mr. Ure's Scheme of Sanitary Administration: The Act of 1862 and formation of the first Sanitary Committee: The City Improvement Act (1866), - - - - - 1

CHAPTER II.

The Decade 1862-71. First Efforts of the New Administration.

(*a*) Administration: Early Recognition of Evil Results attending Domestic Overcrowding and the defects of House Construction as a cause of Mortality: Typhus as a Disease of overcrowding, and the value of ticketing smaller sized Houses as a means of extinguishing it.

(*b*) Hospitals: Their Construction, Equipment and Organisation: Difficulty in obtaining Nurses: Defects in existing Policy of Hospital Provision, - - - - - - - 27

CHAPTER III.

PAGE

GENERAL RESULTS. 1875-94.

Development of Administrative Action: Position of Infectious Diseases in History; Science and Practice of Public Health, 54

CHAPTER IV.

HISTORY OF HOSPITAL ACCOMMODATION FOR INFECTIOUS DISEASES IN GLASGOW.

General: Early Distinction between the Prevention of Infectious Disease and its Treatment: A Century of Hospital History: Development of Municipal Policy as to Infectious Diseases: The Policy and Practice of Glasgow in the Management of Epidemic Disease, - - - - - - - 65

CHAPTER V.

IMMEDIATE RESULTS OF DISPLACEMENT FROM INSANITARY DWELLINGS.

The Operations of the City Improvement Trust, 1874-75 and '77: The New and Old House compared with regard to size, rental, number of inmates, distance from centre, etc.: Overcrowding of Buildings on Site and of Persons in Dwellings considered: Structural Defects which accompany: Provision for Persons displaced: Need for a Building Regulation Act: The Hygienics of the Flatted Tenement: The Doctrine of Density in Relation to Health: Effects of Density in Composition of air, - - - - - - - - - 95

CHAPTER VI.

THE SOCIOLOGICAL ASPECTS OF SANITATION.

The House: The House in Relation to Public Health: Life in One Room: Ticketed Houses: Uninhabitable Houses: Common Lodging-Houses: Some Sociological Aspects of Sanitation: Sanitation and Social Economics—An Object Lesson: Public Health and Social Problems: The Children of the City—What can we do for them? - - - - 147

CHAPTER VII.

STUDIES IN EPIDEMIOLOGY.

(1) Special Methods of dealing with Infectious Diseases and their Results: Criterion of Success in the use of Hospitals:

PAGE

Typhus Fever: Small-pox: Vaccination Defaulters: Enteric Fever: Milk Epidemics: The Sanitary Control of Dairy Farms: Scarlet Fever: Measles: Whooping-cough: Diphtheria and Croup: Effect of Notification Act: Diarrhœal Diseases—Reduction in Incidence of Adult Diarrhœa consequent on Introduction of Loch Katrine Water Supply: Cholera: Erysipelas: Puerperal Fever: Chicken-pox: Influenza: Phthisis and Diseases of the Lungs: Miscellaneous Unclassified Diseases, 324

(2) The History of an Outbreak of Febrile Disease in St. Mary's Industrial School for Boys, - - - - - - 376

(3) On the Sanitary Requirements of a Dairy Farm: The Farm Steading with reference to the Health of the Inmates, and to the Business of Milk Production, and to the Health of the Cows: Disease in Man and Cows in relation to Milk: Need for Cleanliness: Summary of Requirements, - - 406

(4) Report on Certain Cases of Sickness and Death occurring among the Workers of a Hair Factory (Anthrax), - 412

CHAPTER VIII.

CLINICAL STUDIES.

(1) Stimulation in Typhus Fever in Relation to Age, Mortality, Puberty, Pregnancy, Day of Fever, and Fatal and Critical days, - - - - - - - - - - 444

(2) Small-pox in relation to the Modifying Influence of Vaccination: A Study of 972 Cases: Number and Quality of Vaccine Marks, Extent of Eruption: Influence of Vaccination on Mortality in relation to Sex and Age, Extent of Eruption: Influence of Age in Natural Disease: "Drift" in Unvaccinated, Badly Vaccinated, and Well Vaccinated compared, - - - - - - - - - - 466

CHAPTER IX.

STUDIES IN VITAL STATISTICS.

Early Enumerations of the Population: Numbers subscribing the Confession of Faith: Bills of Mortality: Dr. Gairdner's Scheme of Enumeration Areas.

The Vital Statistics of Glasgow:—

Part I. History of Attempt to establish a System of District Statistics: Difficulty in obtaining trustworthy data: Ages of District Populations: Argument for Local Statistics: Correction for Institutions: Relation of Death-rates to Density and House Accommodation in Scotch Towns: The Average Size of House, Number of Inmates, Percentage of Population living in One Apartment, etc.

PAGE

Part II. The Districts of Glasgow: Comparative District Mortality: Percentage of Deaths Uncertified: Illegitimacy and Insurance of Lives in Friendly Societies: Imperfection in District Data as to Size and Occupancy of Houses: The "Standard House" and the "Standard of Occupancy": House Accommodation in relation to Death-rates from (*a*) Acute Diseases of the Lungs, (*b*) Consumption, (*c*) Infectious Diseases; and to Birth-rates, Infant Mortality, Illegitimacy: The New House Accommodation of Glasgow: Air Space and Height of Ceilings in "rooms" in "new" and "old" Glasgow: Vital Statistics of Four Groups of Districts of Glasgow and of the Nine Suburban Burghs: Comparative Air-Space and Death-rates in the Suburban Burghs: The Standard of Occupancy as Illustrated by the Suburban Burghs.

Part III. Certification of Deaths: Life Insurance, - 481

CHAPTER X.

PREVENTION OF TUBERCULOSIS.

Tuberculosis in General: What is Tuberculosis? The Biology of the Bacillus: Tuberculosis in Man: Infection by Sputum and other Discharges: Infection by Milk and Flesh: The Conditions which Control Infection. What ought the Local Authority to do? Is Tuberculosis an "Infectious Disease"? Compulsory Notification: Isolation: Disinfection: Popular Instruction: Cornet's Leaflet—"Protection from Consumption": Berlin Leaflet—"Measures against the Spread of Consumption": Tuberculous Meat and Milk, - - - 529

CHAPTER XI.

ON DISINFECTION AND THE PHYSICAL LAWS WHICH GOVERN THE DISTRIBUTION OF INFECTION, - - - - 571

CHAPTER XII.

MEAT INFECTION.

The Detective System *v.* the Clearing-House System, - - 592

INDEX, - - - - - - - - - - - 610

BIOGRAPHICAL NOTE

BY THE EDITOR.

ALTHOUGH a simple record of work accomplished must always remain the most fitting record of a life spent in the service of others, there exists the natural desire in the mind of the reader to get beyond the work to the personality of the worker, and to the surroundings of the every-day toil amidst which the work itself was done.

It seems desirable, therefore, if only for the information of the large class of readers to whom Dr. Russell was known only, or chiefly, through his writings, that some notes of a biographical character should be added to the outline of his work contained in Sir William Gairdner's prefatory note.

Some reference may first of all be made to the circumstances under which the preparation of the present volume was undertaken. In a note in the *Scotsman* on the morrow of Dr. Russell's death, Sir William Gairdner—as he himself states—gave public expression to the feeling which was present in the minds of many, that a selection of the many papers which Dr. Russell had contributed to the literature of Sanitary Science and allied Social questions, should be issued in the form of a memorial volume.

The suggestion was taken up most sympathetically by the Committee on Health, and finally obtained the unanimous approval of the Corporation of Glasgow, who appointed the Convener of the Health Committee (Councillor W. F. Anderson) and Councillor Clelland, along with the present writer, to prepare the volume for the press.

On the last has fallen the responsibility of selecting and arranging the papers.

When this work was considerably advanced, there were discovered among Dr. Russell's papers copies of several of those now grouped together in the Chapter on the Sociological Aspects of Sanitation, in which annotations had been made by himself with a view to their re-issue,[1] and care has been taken in the present volume to give effect to such alterations as his manuscript notes shewed to have been his intention.

As indicated by Sir William Gairdner, a strictly chronological arrangement of the papers has not been adopted in the present volume. Nevertheless the aim has been to present them so that the history of sanitary progress, as illustrated by the development of public health administration in Glasgow, may be traced from the period of awakening interest in the first half of the Nineteenth Century until that in which much that engrossed the attention of the pioneers of sanitary reform had passed away with the generation which had set itself so strenuously to accomplish this object. Some such form indeed was suggested by Dr. Russell's Memoir on the subject, and the narrative contained therein has been here adopted as descriptive of the general movement which the other papers selected for reproduction may serve to amplify or illustrate.[2]

But while the illustrations are drawn from local conditions, the administrative problems which they presented are common to all large communities, and the successive steps in their solution may serve in turn to illustrate many of the phases through which public health legislation generally has passed during the last half century.

Where it seemed desirable, a short summary of the contents has been inserted by way of introduction to several of the chapters, in the hope that the path of the general reader may be made easier.

For some years prior to his death, Dr. Russell was Medical Member of the Local Government Board for Scotland, but most of his best work was accomplished and almost the whole of his life was spent in the service of the Corporation of Glasgow.

It is a fitting tribute, therefore, to the service which he rendered to the city of his birth, that a volume dedicated to his memory should be issued under the authority of its Town Council.

Dr. Russell was born in Glasgow in 1837, and his boyhood and early youth were spent in the neighbouring burgh of Rutherglen under the influence of his paternal grandfather, whose sterling worth of character was in time to be reflected in his grandson. His early education was completed in the High School of Glasgow, from which he passed to the University, where he enrolled as a student in the Arts Faculty in the Winter Session of 1854-5. Graduating as Bachelor of Arts in 1858, he began the study of medicine in the following winter. In the interval, however, he was selected by Lord Kelvin (then Prof. William Thomson) as one of his assistants on board the "Agamemnon" and at Valencia, during the first successful effort to lay the Atlantic Cable between Europe and America, and the incidents of the voyage were afterwards related in "Leaves from the Journal of an Amateur Telegrapher" published in the *West of Scotland Magazine* in 1859.

---

[1] In response to repeated suggestions, but interrupted by recurring illnesses.

[2] The desirability of compressing the work within the limits of a single volume rendered it necessary to omit the text of several important papers—more especially those in which the successive milk epidemics of enteric fever were traced—but their bearing on subsequent legislation has been noted, and effort has been made to render the list of published papers, which is appended hereto, as complete as possible. Copies may be found either in the Library of the Faculty of Physicians and Surgeons or in the Library of the Royal Philosophical Society, Glasgow.

After a distinguished career in the classes of the Faculty of Medicine, he graduated M.D., C.M., at the University of Glasgow in 1862, and spent the next two years first as House Physician in the Glasgow Royal Infirmary, and afterwards in the hospital wards of the City Poorhouse. On the erection of Parliamentary Road Fever Hospital, he was appointed, on the recommendation of Dr. Gairdner, its first Medical Superintendent, and here he continued almost until his appointment as Medical Officer of Health in 1872, in succession to Dr. Gairdner. When the Local Government Board for Scotland was reconstituted in 1894, he found himself unable to accept the suggestion then made that he should transfer his services to the wider field which thus offered; but the invitation being again renewed in 1898, he accepted the position of Medical Member of the Board. After six years' service there, his death occurred in Edinburgh on October 22nd, 1904, and the loss to sanitary science in general, and especially to sanitary administration in Scotland, was at once reflected in medical and lay journals alike. With almost singular unanimity, all bore witness to the strength of purpose and high moral aim which characterized and inspired his work: from almost none, was the note of personal regret absent. Rarely indeed were man and work more happily conjoined, for to the power of scientific analysis which the work required, he brought the added gift of a synthetic imagination which found no circumstance of human life isolated or unplaced. To this rare combination of faculties, and to the command of a literary style which was always pleasing and lucid, and could on occasion be picturesque and forcible, the literature of Sanitation owes much that is stimulating and suggestive.

From the application of these qualities to the work of his after years, it is interesting to revert to the period while they were still developing, and the following notes of appreciative description by a life-long friend and former fellow-student (the Right Honourable James Bryce, M.P., author of *The Holy Roman Empire*, &c.) will be read with interest :

"James Burn Russell and I were fellow-students at Glasgow University in 1853-57. He was not very widely known in those days, being naturally of a modest and retiring disposition ; but he had won the warm respect and affection of those who came to know him well. He had not then turned his thoughts to science, but was showing a remarkable gift for literary production, and an equal capacity for the criticism and appreciation of literary work. His reading in English authors, and especially the English poets, including the older ones, such as Chaucer, and even the Anglo-Saxon Caedmon, was unusually wide ; and in all questions relating to them we were accustomed to defer to his opinion, which was sure to be based on exact study. His own verses had the charm of refined thought and a simple grace of expression. His friends often wished in later years that circumstances had permitted him to cultivate this gift. But he was singularly devoid of any desire for fame ; and his professional work carried him off into very different fields. With this love of poetry there went a great love of natural beauty. He lived, if I remember right, at or near Rutherglen, which was then a quiet little town in a pretty country, and I can recall walks with him over the Cathkin Hills, one of his favourite spots. The sweetness of his temper, and his power of drawing pleasure from simple things, made him a charming companion, as the range of his attainments made him no less an instructive one, from whose talk one always went away the wiser. The mental qualities then discernible, which contributed to his subsequent eminence in his professional career, were, I should say, his habits of accurate observation, of patient reflection, and of steady devotion to whatever work he undertook. He was solid rather than swift, careful, exact, conscientious, with a winning gentleness of nature. We all felt sure that he would attain high distinction, though we could not foresee in what line his work would lie. There can be but few left who remember him from those days, but they must all cherish his memory as one of the most pure and candid souls they have known, full of sympathy, bent on high things, true and constant in friendship."

Writing in the *Glasgow Medical Journal* for December, 1904, Sir Hector C. Cameron records as of interest in relation to the work which engaged Dr. Russell's attention in after years, that he seemed "specially to have been attracted by literary and scientific study," and in consequence many of his prizes were gained in those two departments of intellectual exercise. Thus in 1854 (Humanity—Private) he was bracketed second for English verse composition. James Bryce (now the Right Honourable James Bryce, already mentioned (being first; in 1855-56 (Logic—Junior) he was awarded a prize for the best verses on the subject, "Italy: A Sardinian Poet's Dream"; also a prize (Humanity—Vacation Exercises) given for the best translation into English verse of certain pieces of Catullus; in 1857-58 he gained a prize (Natural Philosophy) for Special Investigation on Electrolysis; in 1858-59 he won the University Silver Medal for the best essay on Vital Dynamics; and, in 1860-61, the Lord Rector's prize for the best essay on "The Probable Influence of Western Civilisation on the Social, Political, and Moral Condition of China."

It has been the privilege of the present writer to peruse many of the literary fragments which remain of this period of Dr. Russell's life. Some of these are collected in a volume of miscellaneous papers, largely in manuscript, others appeared in the *Glasgow University Album* for 1858-59, which was edited by students. To some of them only can reference be made, although interest attaches to all. All bear witness to the power of facile and graceful expression which even at this period had already attracted the attention of his fellow-students. Nor is their variety less noteworthy.

Life is full of buoyancy, and the invitation in the "Song of the Blue Tit"—

> "Who would be merry must come with me
> Now here; now there; on the swinging tree."

reveals a habit of communing with Nature which was the source of one of his chief enjoyments in life.

Or again, it is memory that speaks with a soothing cadence, and in the opening lines of a "Reminiscence" addressed to an uncle, we catch the gift of melodious expression to a degree which is far from common—

> "Voice of friendship! Voice of kindness!
> Oh! how sweet it is to hear
> All those accents, soft and soothing,
> Wooing the enchanted ear.
> Oh! 'tis sweet as ere was music
> On a peaceful summer's day,
> Gently breeze-borne o'er the ocean,
> Chasing every care away."

Indeed he possessed a power of versification of no mean order, but probably nowhere better shown than in a translation of part of a chorus in the "Agamemnon" of Aeschylus, prepared as a class exercise. The incident described occurs when the Grecian Fleet is storm-stayed at Aulis, on its way to

Troy. Agamemnon had killed a hart belonging to Diana, and is told by the priest Chalchas that unless he sacrifices his daughter Iphigenia to the goddess the storm will not abate. The Apostrophe to Zeus runs thus :

> "* * * but Zeus remains,
> And he to purest thought attains,
> Who chaunts in loud triumphant lays,
> With honest heart his matchless praise :
>
> His, who sons of earth has taught
> How to climb the heights of thought ;
> His, who fixed that hours of pain
> Should alone experience gain.
> Pangs, the fruit of bygone ill,
> Oft through slumbering bosoms thrill ;
> Oft the voice of wisdom finds
> Paths to reach unwilling minds ;
> Oft to life in mortal hearts
> Awe of heaven, unbidden starts."

Of more serious effort in the realm of pure literature there may be cited as illustration a paper "On the Nationality of our early poetical Literature," which was published in the volume of the *University Album* already mentioned. The argument is directed to show that the social life of a period, even before the day of Piers Plowman and Chaucer, may be reconstructed from its ballad poetry.

Again, in "Caedmon, our Anglo-Saxon Milton," the Cowherd, and ultimately the poet-monk of Whitby, the author of the "Dream-Song" and the "Metrical Paraphrase," we are led to "the cradle of English literature and English greatness. . . . The first faint utterance of history is an echo of the lyre. We find nations emerging with songs on their lips ; songs of which snatches still survive, preserving the mind and spirit of the past, and even enabling us to conjure up bodily forms although they be often like phantoms."

In the last example of his work at this period to which we can refer, "Illustrations of Anglo-Saxon Mind and Manners, Pagan and Christian, from the native poetry," there is a further and more sustained effort of the synthetic imagination applied to the social life of England in the sixth century ; and we leave this portion of Dr. Russell's life with the feeling that if administration had not claimed his energies in after years, the power of reconstructing social conditions from the literary survivals of a period would have won for him laurels in the domain of scientific history.

Early in his career as a student of medicine, he came under the influence of Lord Lister, who was at that time just entering on his duties as Professor of Surgery at the University of Glasgow, and here again we may quote from the notice by Sir Hector Cameron, already mentioned. "Lord Lister, who ever held Russell in high esteem, narrates an interesting fact of those student days in a recently written letter. 'One thing,' he writes, 'I remember about Russell that indicated the high opinion the students had of him. At the end of my first winter course, the class presented me with a document expressing their gratitude for my lectures, &c., and Russell was the man commissioned to read it to me. That class was an unusually large one, as the men of the fourth year attended it as well as those of the second and third years. Russell's selection by a class of so many senior students was really strong testimony of the esteem felt for him.'"

At the same time he was also a member of Sir William Gairdner's first class, after his appointment to the Chair of Medicine in the University of Glasgow in 1862-63.

It is not difficult to trace in this early association with these masters of scientific method the stimulus afforded to a mind already developing along lines of close observation and critical enquiry into causal relationships, and the influence of the association was shortly to be turned to practical uses on Dr. Russell's appointment as Medical Superintendent of Kennedy Street Fever Hospital in 1865.

Municipal Fever Hospitals were still in the stage of experiment; and his hospital reports are models of terse and pointed reasoning. Everything had to be thought out, from the design of the hospital buildings to the organisation of its nursing staff. Difficulty was but a stimulus to the discovery of methods by which it might be overcome, and from the lack of suitable women to act as hospital nurses there emerged a forcible appeal for the education of women to undertake the duties of private nursing.

Again, when he took up the duties of the office of Medical Officer of Health, much of the machinery of administration which had been devised during the previous decade was largely untried, and much that now forms the every-day weapon of the Sanitarian had still to be forged.

Epidemics and their repression supplied the dominant note in sanitation. Conclusions as to their method of spread lay along the lines of inductive reasoning, and the doctrine of particulate contagion was fast becoming a working hypothesis of great value.

In the year following his appointment as Medical Officer of Health, an outbreak of enteric fever occurred in Parkhead, which was to afford material for the first of a series of brilliant studies in the epidemiology of the disease, and to help in no small degree to establish the doctrine that infection might be conveyed by milk. Having establish this first in a local example, subsequent outbreaks were utilised to illumine the whole current of the milk supply of towns, from its production until it reached the consumer.

Legislation now provides an easy method of obtaining from the purveyor of any milk supply associated with the distribution of disease, complete details both as to its source and distribution. But at the time we write of no such provision existed, and the case against a suspected milk supply might require to be established in face of a refusal to disclose information which might, it was erroneously believed, prove prejudicial to the trade interests of the vendor. Each report revealed some new avenue by which infection might gain access to milk; now it was an impure water supply; or, again, the alternative use of the milk scullery for the purpose of a domestic washing-house; and the result was to build up a picture of the insanitary condition of Dairy Farms which did much to stimulate a demand for reform in this branch of rural sanitation, and also to show the direction in which it might be accomplished.

We have elsewhere indicated the methods which he adopted shortly after his appointment as Medical Officer to familiarize the public mind with the methods by which infection may spread. The infectious diseases of childhood, in particular, had in the past been almost beyond the reach of administrative effort, but the expansion of the hospital system, after the erection of Belvidere, opened up new opportunities of dealing with them. Here, as in so many other instances in his work, the prevalence of infectious disease became the guide to conditions prejudicial to health otherwise; and the pathos of child-life in cities stirs him to describe the modern city as the product of a " Board of Bachelors, or Malthusians, or Herods," so little had the requirements of healthy childhood been considered.

This paper on the " Children of the City " formed almost the first of a notable series of studies on the Sociological aspects of Sanitation which followed in quick succession, and which did much both to quicken public interest in the well-being of the poor in cities, and to create a sense of social responsibility for conditions which had arisen among them during a long period of neglect. Facts were collected with a wealth of detail formerly unknown in such enquiries, and their collation resulted in graphic representations which unaided rhetoric alone would have failed to accomplish. Around a full knowledge of the conditions which form the groundwork of these papers there plays the force of a vivid imagination, which renders them picturesque; and when the deep human sympathy which prompted it all becomes apparent, the appeal for active measures of reform becomes irresistible.

But while the life of the poor under conditions irreconcilable with moral and physical well-being ever stirred him to remonstrance, his nature revolted at the evidence of moral obliquity with which it was so frequently interwoven. Justice to the well-doing demanded equal justice to those who perforce prey on them. Intemperance and vice were not only social offences but factors in disease, and if their victims were to be redeemed, the first step in the process of reform was to create in them a sense of civic responsibility.

How much of this might be accomplished through patient and continuous effort along the lines of administrative hygiene is a theme to which he reverts again and again with ever-varying illustrations.

Patient perseverance in well-doing was indeed with him not only an axiom of life, but a principle of action; and, social reformer though he was, his methods were not of the sort commonly called heroic. To the inhabitant of the wynds the problems of life were problems of hygiene, and so hygiene could become the handmaiden of reform. But before reform was possible, the slum dweller had to be brought into social perspective, not only because he was a ready prey to diseases which had an uncomfortable tendency to spread, but also because he was surrounded by conditions which were beyond his unaided power to remove, and which, so long as they continued, threatened to strangle the impulses to good with which he was endowed. It was on this that the strength of his appeal for the elevation of the poor to a higher plane of civic recognition rested.

Something of the statesman's power of reading lessons for the future in the experiences of the past was also his. In the early years of his appointment as Medical Officer of Health, extensive clearances were being effected under the first City Improvement Act. But the complement to displacement—the power to prevent the erection or alteration of dwellings which would reproduce the defects of the old—was still required; and time and again he insisted on the need for building regulations to control this, long ere their acquisition became an accomplished fact.

One who was in friendly intercourse with Dr. Russell for many years, and associated with him in shaping the later policy of the Health Committee—ex-Bailie Robert Crawford, LL.D.—writes of him :—I avail myself gladly of this opportunity of associating myself with all those who bear testimony to the marvellous results achieved in Scotland, and to a large degree also throughout the kingdom, by the exercise of Dr. Russell's great moral and intellectual gifts, stimulated as they were, constantly and vividly, by a burning zeal and passion to benefit humanity.

It was my high privilege to enjoy the close personal friendship of Dr. Russell for over twenty years, and during thirteen of these years I was in almost daily touch with him in many matters, official and individual—first as a member, and latterly for ten years as chairman, of the Committee on Health. These years were for "my chief" (as I always styled and felt Dr. Russell to be), as well as for myself, years of intense conviction, burning desires, and remarkable progress in the development of Glasgow towards the possibility of a clean and healthy life for all its citizens, and my association with him during this period of "incandescence" produced a revolution on my whole outlook on the world and its affairs, and developed in me an affection and admiration for the man, his nature and his work, which nothing can ever diminish or impair.

In writing thus of one whose memory I will ever reverence, I can also testify that my predecessors who worked in close official and personal contact with this great pioneer of public health were inspired by the same feeling. The first chairman of the Glasgow Health Committee, and the man who in darkness, doubt, and difficulty laid the foundation of the sanitary administration in Glasgow, was John Ure, LL.D., who, during his term of office as Lord Provost of the city, retained also the post of "Chairman of Health," so deeply was he attached to this work. Succeeding him as chairman came Mr. W. R. W. Smith, a breezy, enthusiastic reformer of unconventional nature, who for some years carried the sanitary administration of this city forward with rapid strides, and on his retiral nominated me as his successor, after infecting me with some share of his own cheery optimism in dealing with obstacles and difficulties. When I took up the reins and essayed to continue the work which they had established with so much labour, and with so great success, I found that they had received the same inspiration of motive, the same enlargement of view, the same comprehension of principles, and the same passion for the work from Dr. Russell as I was myself to experience, and that their affection for, and appreciation of, his beautiful nature had been, and remained, a constant joy to them.

Nor were those feelings confined to those who in the course of public business came very close to Dr. Russell. They were shared in little less degree by every member of his committee, by every representative and official in the Corporation, and by his fellow-citizens generally; and his enduring monument will ever consist in the great and valuable work which he accomplished for the city which he loved, and in the gratitude which the citizens will ever bear to his memory.

Intimately as I knew Dr. Russell during the most active and productive period of his official and public life, I find it hard to pick out and differentiate the special qualities which might be supposed to have led to his great success in a prominent public position, and exposed therefore to continual criticism from all sides, and to opposition from interests adversely affected by his action on lines of public policy. He was averse from advertising himself, modest and retiring, continually full of reason and moderation in meeting the difficulties of individual hardship in the carrying out of public policy, and yet firm and unswerving in maintaining the broad principles of the public weal as opposed to class interests. It became necessary for him frequently to lay down sharp and definite lines, which seemed to cut deeply into the accepted rights of property while necessary for the conservation of health and life; but so graciously was he esteemed, and so convinced were all classes of his wisdom, sagacity, and moderation, that it was rare indeed to find his judgment questioned or his conclusions seriously combatted. To me it seemed that his influence and prestige—among his professional brethren throughout the country and with all classes of the people in his own city and neighbourhood—arose from a special combination of rare qualities and gifts which I can best express by the description of "Guide, philosopher, and friend"—which he was indeed to me.

The readers of this book will learn for themselves how highly qualified he was to guide the action, quicken the conscience, and illuminate the understanding of a great community, brought face to face as it was with the complex sanitary and social problems which became acute about the middle of the last century, and are still only partially solved. With admirable prescience Dr. Russell seemed to grasp clearly, not only the right direction in which to move, but exactly how far it was practicable for the public authorities to advance in any particular direction at any given time. He seldom had to vary his course—never so far as I can remember had to retrace his steps—and, on the other hand, he never provoked reaction by going too fast or too far. He had to verify all his conclusions by scientific inquiry—he assiduously educated the responsible authorities and the public as to their line of duty—and while seeing very far ahead himself, was content to achieve day by day what was then practical and possible. In private intercourse I found him an idealist, throbbing with impulse in many directions for the good of humanity, and very impatient and indignant with narrow-minded objectors and unsympathetic obstruction to progress, but preserving all the time to his committee and to the Town Council in all his recommendations a certain patient dignity and impassiveness, as of a mind convinced—unhasting and unresting. At committee meetings he spoke very little, and only when called upon by the chairman. But his personal magnetism seemed always to dominate the proceedings, his ideas were always sympathetically discussed, and his conclusions were clothed with a sense of authority. His greatest power, however, lay in his pen. As a master of tense, lucid, convincing English I have never met anyone to excel him. And this, too, on subjects of an unattractive kind, such as slum dwellings, obstructive buildings nuisance, outbreak of epidemic disease, &c. His reports on these subjects cut clean as a surgical instrument, and always achieved their purpose.

It is not my province to refer to the many notable advances made and deeds accomplished by Dr. Russell while medical officer for Glasgow. They are written in this book, in the records of the Town Council, and elsewhere. The full results of his work can never be written in any book, but may be seen by all who can compare the condition of life in Glasgow—especially in the poorer quarters—with what prevailed 30 to 40 years ago. Dr. Russell took no narrow view of the functions and responsibilities of his office, nor of the responsibility and duties of a Health Committee. It was not enough that the immediate and direct work for which they were primarily responsible should be well done. He always held that it was their duty to guide, and if necessary to stimulate, all other departments of the public service whose work touched directly or indirectly on the great matters affecting the amenities of life in a city. He was an ardent advocate of the gospel of soap and water, sunshine, air, and room to live and move. Hence his aid and counsel were often called in to advance questions outside his immediate jurisdiction, such as the cleansing of the city, water supply, the provision of baths and wash-houses, parks, recreation grounds, and open spaces, building regulations, sewage purification, and a host of cognate questions. On all such matters his views were clear, broad, and philosophic, and to have had the great advantage of freely discussing these subjects with him in all aspects, as I constantly had, was in itself a liberal education. Many of Dr. Russell's public friends had the impression that in spite of his graphic lucidity in writing he was reticent and timid in the expression of his views in ordinary talk or discussion. In one way this was true. When called upon to speak at a meeting of committee or before a mixed company of any sort, he was always reticent and almost painfully reserved, and indeed seemed to have difficulty in giving ready or adequate expression even to views or convictions which already existed in his mind in a clearly cut and carefully considered form.

In striking contrast to this, however, his most intimate associates knew Dr. Russell to be a most delightful ready give-and-take debater, full of swift perception, keen wit, and rippling merriment. An hour's talk with him on such subjects as I have mentioned acted on one like a tonic or a holiday. This broad, philosophic outlook gave him a splendid comprehension and grasp when writing a report on subjects beyond the technical details and statistics of his own special work. He had a quick and clear view of the right relationships that ought to exist between the various units making up a community. Necessarily the rights, duties, and responsibilities of property as related to the rights of the community in matters of health and life are never absent from the mind of the Medical Officer of Health and the Sanitary Inspector in a city like Glasgow. On this subject his views were those of an idealist, his practice moderate and progressive, his advice always practical and sound. Courtesy, moderation, and reason were his watchwords, and it is not too much to say that largely through his wise advice and moderate counsel the whole tone and attitude of the landowner, landlord, and factor towards the public authorities changed during his term of office from bitter opposition to one of reasonable if not even cordial co-operation.

Of a similar character were his opinions about the relations which should exist between the individual citizen and the community as represented by the public authorities. Dr. Russell had little faith in the possibility of the redemption of the worthless members of the "submerged tenth." He would have isolated them or banished them "furth of the city," and would have prevented their further importation. He had just as poor an opinion of the value of charitable doles as a means of permanent improvement of the conditions of the parasite class, and was opposed to pampering of every kind. On the other hand, he had clear and decisive views of the "right to life" which belongs to all citizens alike. Uninhabitable houses were his abomination, as were dark closes, filthy courts, narrow streets. and absence of light and air. He held it to be the duty of the community to prevent the use of all dwellings incompatible with decency, cleanliness, and health, and to put an end to all physical surroundings and conditions tending towards the production of the "undesirables," and to create, or cause to be created, such a condition of physical environment as would ensure for every man, woman, and child in the city the possibility of leading a clean, cheerful, healthy, and therefore useful life. On the duty and responsibility which attach to such individuals in relation to the community, he was no less clear. He had scorn and contempt for that kind of citizenship which thinks it has done all that is required of it when it reluctantly pays its rates, and wants things done for it which it can quite well do for itself, evading all the moral claims which the community is entitled to have upon every one of its members.

Glasgow thus possessed in Dr. Russell an official and servant whose whole life and work have been of a character to arouse and stimulate every form of civic virtue, and to encourage all movements for municipal progress. He has gone from us, but his influence still lives, and moves men to thought and action.

"Yea, saith the Spirit, for their works do follow them."

It was characteristic of him that every moment of life should be filled with the expression of some purpose.

In 1868 he undertook the editorship of *The Glasgow Medical Journal*, and under his guidance that magazine entered upon a new term of usefulness. In 1870 Mr. Henry E. Clark, L.R.C.P. Edin., M.R.C.S. Eng. (now C.M.G., and President of the Faculty of Physicians and Surgeons, Glasgow), became associated with him in the editorship, and the *Journal* was continued under their joint management until Dr. Russell's appointment as Medical Officer, when he retired.

To an illness which confined him to his room, and largely to bed, for weeks together, we owe one of the most interesting monographs possessed by any municipality on the Evolution of Administrative Hygiene. During the same illness, but at a later period, he published a report on the Prevention of Tuberculosis, which was afterwards issued—with permission—by the Government of Massachusetts as a State paper; and after ten years it is still the most complete study of Tuberculosis that exists, from the standpoint of administration.

Public recognition of his work was extensive and varied. A report on Anthrax among Hair-workers, published in 1880, was included in the Appendix to the Annual Report of the Medical Officer to the English Local Government Board for the year 1878. In 1885 his *Alma Mater* conferred on him the degree of LL.D. (*honoris causa*); in 1891 the British Medical Association awarded him the Stewart prize for his researches on "The Origin, Spread, and Prevention of Epidemic Disease"; and in 1889 he received the first Bisset-Hawkins Memorial Medal, awarded by the Royal College of Physicians of London for zeal in the promotion of public health. On the appointment of the Royal Commission on Sewage Disposal, he was nominated one of its members. He was also an honorary member of several foreign societies for the advancement of public hygiene.

Many of his papers were first issued as addresses to the Royal Philosophical Society of Glasgow, of which he was President, first of its Sanitary and Social Economy Section, and afterwards of the Society itself. On his removal to Edinburgh, his name was placed on the list of its honorary members; and at his death, an appreciative sketch of his life was prepared for the "Transactions" of the Society by Dr. Brownlee, Physician Superintendent of Belvidere Hospital.[1] He was a Director of the Western Infirmary of Glasgow, of Anderson's College Medical School, of the Royal Hospital for Sick Children, and of the Glasgow Sick Poor and District Nursing Association. To all he brought a wealth of administrative experience and of sound judgment, which his fellow Directors were not slow to acknowledge. The Central Dispensary he did much to found, and he remained until his death on its Board of Management.

His appointment to the Local Government Board was universally welcomed as a tribute to the eminence of the service which he had rendered to sanitary science, and in the few years which remained to him, after undertaking the duties of his new office, there was ample evidence of the zeal with which they were discharged.

In private life, and in the familiar avenues of friendship, intercourse with him was a stimulus to those whom his lovable personality attracted. Rich in knowledge of the mainsprings of human effort, and with a mind well attuned to the higher harmony which dominates the ages, his conversation was then apt to play over life's mosaic with a wealth of illustration which illumined and defined it. It was the pointed and picturesque language of his writings, but more flexible because spoken.

Earnest he was in all things, regarding every duty as a sacred obligation. Associated through all his life with the Congregational Church in Scotland, he was interested in every scheme which had the welfare of mankind as its object. "While his creed," says the Rev. Ambrose Shepherd, D.D., in a memorial sermon preached in Elgin Place Congregational Church on November 6th, 1904, "was not a long one, it did not shorten as you measured it. The length and breadth, the height and the depth, was the living Christ. When he saw wrong and sorrow, poverty and trouble, he knew what his Lord did in His day, and he was in no doubt about what his

---

[1] To Dr. Brownlee I am indebted for the preparation of a most useful index to this volume.—[Ed.]

Lord would have him do to-day. 'Pure religion, and undefiled,' we are told, 'before God and the Father is this, to visit the fatherless and widows in their affliction, and to keep ourselves unspotted from the world.' And if this is a working definition of Christianity, then our friend translated its letter, as but few men do, into a spirit and life of continuous and practical obedience. 'There is no way more sure,' he once remarked to me, to the loftiest and holiest life of heaven, 'than that which lies through a quick deep sympathy with the needs of earth.'"

Over the closing months of his life there hung the shadow of much physical suffering, yet through the shadow the sterling qualities of his character and his courage stood out in even bolder relief. In the intervals life went on for him with its old zest, and he continued at work almost until the end came.

"He was buried," says Sir Hector Cameron in the article from which we have already quoted, "on 26th October, in the Necropolis of Glasgow, in the presence of a company from which few of his old friends, private and official, were absent; while no board or institution with which he had been connected seemed to be unrepresented. It is seldom one can so certainly trace, as an observer could do on that occasion, the grave expression of a universal grief and regret in the faces of those who stood around the place where the body was laid."

It formed a fitting resting-place for one whose life had been so spent, for, within easy reach of his grave—almost within sight of it—there was growing up a new population and a new city which his work had done much to render possible. "He seems," says one who knew him well, "always to have been of the best." His work was productive of much good while he still lived, the spirit in which it was done remains as a stimulus and inspiration.

Among the every-day problems of sanitation he found ready means of giving practical expression to the religious convictions which lay at the foundation of his character, and helped to make him one of the greatest of modern sanitarians.

It remains to add that his wife, a daughter of the Rev. Peter Davidson, D.D., of Edinburgh, predeceased him by many years, and that he is survived by a son and two daughters.

LIST OF PUBLISHED PAPERS.

	YEAR.
1. Analysis of 300 cases of Typhus Fever (*Glasgow Medical Journal*),	1864
2. Suggestions for the Logical Use of Hospital Statistics (*Hospital Report*),	1866
3. A Clinical Study of Stimulation in Typhus Fever (*Glasgow Medical Journal*),	1867
4. On the Distribution of Enteric Fever in Glasgow (*Glasgow Medical Journal*),	1869
5. Note of Disinfection with Carbolic Acid Vapour (*Glasgow Medical Journal*),	1869
6. Cases of Typhus Fever, fatal, with rare complications (*Glasgow Medical Journal*),	1869
7. Cases of Typhus Fever, fatal, with Intestinal Hæmorrhage (*Glasgow Medical Journal*),	1869
8. On Excretion of Urea in Typhus Fever, in relation to Temperature (in conjunction with the late Dr. Joseph Coats) (*Glasgow Medical Journal*),	1869
9. Clinical Observations on Hydrate of Chloral as a Hypnotic in Typhus Fever (*Glasgow Medical Journal*),	1870
10. Liebreich's theory on the action of Chloral (*Glasgow Medical Journal*),	1870
11. Cases of Pyogenic Fever (Jenner) (*Glasgow Medical Journal*),	1871
12. On Sub-Glottic Œdema of the Larynx and permanent Stricture following Typhus (*Glasgow Medical Journal*),	1871
13. On revaccination (*Glasgow Medical Journal*),	1871
14. Notes on the use of Xylol in Small-pox with reference to the fallacies incidental to the treatment of Small-pox (*Glasgow Medical Journal*),	1872
15. A Study of 972 cases of Small-pox with reference to the modifying influence of vaccination (*Glasgow Medical Journal*),	1872
16. Report of an outbreak of Enteric Fever connected with milk supply (Parkhead) (*Glasgow Medical Journal*),	1873
17. The Air of Glasgow, a review (*Glasgow Medical Journal*),	1873
18. Occasional Reports on local Outbreaks of Epidemic Disease (*Glasgow Medical Journal*),	1874

	YEAR.
19. On the immediate results of the operations of the Glasgow Improvement Trust as regards the inhabitants displaced (*Royal Philosophical Society of Glasgow*), - - - -	1874
20. Report on Construction of Small-pox Hospitals, - - -	1874
21. Report on certain outbreaks of Enteric Fever in Glasgow (Milk Epidemic—South-side), - - - - - - -	1875
22. Further information on the immediate results of the Operations of the Glasgow Improvement Trust as regards the Inhabitants displaced (*Glasgow Medical Journal*), - -	1876
23. An Address on the sanitary results of the Glasgow Improvement Act delivered at the opening of the Section on Public Medicine at the Sheffield meeting of the British Medical Association (*Sanitary Journal for Scotland*), - -	1876
24. Local Vices of Buildings, as affecting the Death-rate (*Sanitary Journal for Scotland*), - - - - - - -	1876
25. Report upon uncertified deaths in Glasgow, - - - - -	1876
26. On the influence of the Friendly Societies Act, 1875, upon the proportion of uncertified deaths in Glasgow (*Glasgow Medical Journal*), - - - - - - - -	1876
27. On the comparative prevalence of Filth Diseases in town and country (*Royal Philosophical Society of Glasgow*), - -	1877
28. Illustrations of a high death-rate independently of Zymotic Diseases (*Sanitary Journal for Scotland*), - - - -	1877
29. Report on outbreak of Enteric Fever in the West-end of Glasgow and Hillhead, with Memorandum on the milk supply of Glasgow in relation to dissemination of disease by milk,	1878
30. Report on the Air of Glasgow, chiefly relative to enclosed spaces and smoke, by William J. Dunnachie, in co-operation with the Medical Officer of Health, - - -	1879
31. Lectures on the theory and general prevention and control of infectious disease, and of air, water supply, sewage disposal, and food, by William Wallace, Ph.D., F.C.S., delivered under the auspices of the Lord Provost, Magistrates, and Town Council of the City of Glasgow, and published by them, - - - - - - - -	1879
32. First principles of cleanliness as regards earth, air, and water (*Sanitary Journal for Scotland*), - - - - - -	1879
33. On the result of Inquiries after defaulters under the Vaccination (Scotland) Act, 1863 (*Sanitary Journal for Scotland*), - -	1879
34. On the conveyance of the contagion of Anthrax to Hair Factory Workers, as illustrative of the particulate theory of infection (*Royal Philosophical Society of Glasgow*). (See also report of certain cases of sickness and death occurring among the workers in Adelphi Hair Factory, Glasgow, 1878, in Appendix to the Report of the Medical Officer of the Local Government Board of England, 1878), - -	1880

		YEARS.
35.	Ventilation. Local Authority of Glasgow *v.* Young (*Sanitary Journal for Scotland*),	1880
36.	Itch. A memorandum on the duties of Local Authorities with regard to Itch,	1880
37.	Certain epidemic outbreaks of Enteric Fever in April, 1880, traced to contamination of milk,	1880
38.	Remarks by the Medical Officer to accompany Quarterly Tables on Mortality,	1873-80
39.	A Sanitary retrospect (*The Decade*, 1871-81, *Proceedings, Philosophical Society of Glasgow*),	1881
40.	The House (*Glasgow Health Lectures*),	1881
41.	The Decennial Census as a basis for the statistics of intervening years, illustrated by the case of Glasgow, with tables from the Census,	1881
42.	Report on cases of infectious disease in Dairy Farms,	1881
43.	On the existing sanitary regulations of the Milk Trade (*Sanitary Journal for Scotland*), Part I.,	1881
44.	On the existing sanitary regulations of the Milk Trade (*Sanitary Journal for Scotland*), Part II.,	1881
45.	Adulterated Butterine (*Sanitary Journal for Scotland*),	1881
46.	Report on an outbreak of Splenic-apoplexy, or Anthrax, at Elderslie, near Glasgow (*Sanitary Journal for Scotland*),	1881
47.	Report on outbreak of Fever at Balfron (*Sanitary Journal for Scotland*),	1882
48.	Memorandum on the Hospital accommodation for infectious diseases in Glasgow,	1882
49.	On transgression of jurisdiction in medical relief of sickness (*Sanitary Journal for Scotland*),	1882
50.	The policy and practice of Glasgow in the management of epidemic diseases, with results, 1881-82 (*Epidemiological Society of London*),	1883
51.	Remarks upon night inspection for overcrowding during last 11 years in Glasgow (*Sanitary Journal for Scotland*),	1883
52.	Sanitary reform in the rural districts of Scotland. A necessity in the interests of populous places (*Sanitary Journal for Scotland*),	1883
53.	On Disinfection (*Glasgow Medical Journal*),	1884
54.	Report on outbreak of Enteric Fever in Glasgow Royal and Western Infirmaries, and at the Fever Hospital of Belvidere in Glasgow,	1884
55.	The houses of the poor and the responsibility of landlords: an address (*Sanitary Journal for Scotland*),	1884
56.	Public Health and Pauperism (*Sanitary Journal for Scotland*),	1884
57.	Children of the City. What can we do for them? (*Edinburgh Health Lectures*),	1886
58.	The Vital Statistics of the City of Glasgow, Parts I., II., and III., including a retrospect of the 15 years 1871-85,	1886

		Years.
59.	On some Sociological aspects of Sanitation (*Proceedings, Royal Philosophical Society, Glasgow*),	1887
60.	The house in relation to Public Health (*Insurance and Actuarial Society of Glasgow*),	1887
61.	Reports on the air of Glasgow, with tables of wind, temperature, and rainfall, by S. M. Dickson, B.Sc., in co-operation with the Medical Officer of Health (7 in number),	1887-88
62.	On the "Ticketed Houses" of Glasgow, with an interrogation of the facts for guidance towards the amelioration of the lives of their occupants (*Proceedings, Royal Philosophical Society, Glasgow*),	1888
63.	The history and circumstances of a peculiar outbreak of febrile disease in St. Mary's Roman Catholic Industrial School for boys, Glasgow,	1888
64.	The City of Glasgow Fever and Smallpox Hospitals, Belvidere,	1888
65.	Life in one room: A lecture delivered to the Park Parish Literary Institute,	1888
66.	Sanitation and Social Economics (*Proceedings, Royal Philosophical Society, Glasgow*),	1889
67.	On Common Lodging-houses (*Social and Sanitary Society of Edinburgh*),	1889
68.	Sanitary requirements of a Dairy Farm,	1889
69.	Errors in diagnosis of infectious disease,	1890
70.	Report on Greening Vegetables with Sulphate of Copper,	1890
71.	On some relations of the business of the Dairy Farm to public health: An Address to the Glasgow and West of Scotland Agricultural Society, January,	1890
72.	Memorandum on the proposed open space in Cowcaddens,	1892
73.	Obituary of W. R. W. Smith,	1893
74.	On food preservatives in relation to the provisions of the Food and Drugs Acts,	1894
75.	Uninhabitable houses: A paper read at the Congress of the Sanitary Association of Scotland,	1894
76.	The evolution of the function of Public Health Administration, as illustrated by the sanitary history of Glasgow, etc.,	1895
77.	Prevention of Tuberculosis,	1895
78.	On the physical laws which govern the distribution of infection: An Address as President of the Preventive Medicine Section, British Institute of Public Health, Glasgow Congress,	1896
79.	A history of meat inspection in Glasgow. The detective *v.* Clearing-house system. An Address as President of the Sanitary Association of Scotland, Annual Congress, Dumfries,	1896
80.	Public health and social problems: An Address to the Glasgow University Medico-Chirurgical Society, February,	1898

CHAPTER I.

THE FIRST HALF OF THE CENTURY: A PERIOD OF AWAKENING.

When the progress of hygiene during the nineteenth century comes to be treated historically, a rough distinction may not unreasonably be drawn between the period in which public opinion was slowly ripening towards an intolerance of the overcrowding and grosser physical surroundings of life which the rapid growth of towns had made clamant, and that which followed when the removal of these conditions became the objective of much legislative and administrative effort. And to fairly appreciate the progress during this later phase some knowledge of the precedent conditions is necessary; for in them, once their relationship to disease was recognised, lay the stimulus to reform.

What these precedent conditions were, and whence they arose, are now matters of history. The industrial revolution, which the introduction of the factory system had inaugurated, was already producing, early in the century, rapid changes in the distribution of the population of the country.

Villages sprang into being wherever mineral wealth abounded, or a mountain stream could be harnassed to a mill wheel; towns entered on a period of growth unparalleled in their past history.

And with the new industrial conditions, came the ever-increasing demand for labour, which the rural districts gave freely of their manhood to supply.

A social revolution was to follow the industrial one; but the rising centres of industry, which were quickening with the new and strange life, were at first ill-adapted to cope with the industrial invasion. A new sense of civic responsibility was to be evolved from the chaos which resulted; but the time had not yet come when the modern city could recognise that its chief dangers lay within its own gates.

Populations had not as yet learned to appreciate the dangers of aggregation; and so pressure on area—or density of population—came to be lightly regarded. Nor were the requirements of refuse removal held in greater urgency, and accumulations were permitted in and around dwellings, which only convenience and an ignorance of their danger could tolerate. From this pollution of the soil arose also danger to water supplies, but it required an invasion of cholera to interpret the lesson which the more prevalent water-borne diseases failed to enforce.

And so, on a groundwork of overbuilding, overcrowding, pollution of soil, air, and water, fever prevalences grew apace, and for a time obscured by their magnitude the less startling but equally destructive ravages of lung diseases, and the diseases of childhood.

The life of the worker under such conditions could not but be held on a very insecure tenure. Sickness came to impair his economic value; and it is an interesting fact, now frequently overlooked, that sanitary administration as a function of government was evolved from an enquiry into the causes and conditions of poverty. The reports of the Poor Law Commission in England with which the names of Sir Edwin Chadwick and others are so closely associated, drew attention to the large proportion of pauperism which was due to preventable diseases. This led in 1843 to the appointment of a Royal Commission on the Health of Towns, and the report of this Commission formed the basis of the first Public Health (England) Act of 1848.

The first half of the century was thus essentially a period of awakening to the Public Health dangers which lay in the path of the new Industrialism, and what was true of towns generally, was almost in a special sense true of Glasgow in particular. Contemporary observers have left on record their opinion that its population during this period were living under conditions worse probably than any other town of the kingdom, and it is from this point that its advance in hygiene is to be measured.

During a period of exhausting illness in 1895, Dr. Russell devoted the weeks of his enforced rest to the preparation of a monograph, which was published towards the end of that year, in which he traced the Evolution of the Function of Public Health Administration as illustrated by the Sanitary History of Glasgow in the nineteenth century.

This monograph is in many ways unique. It begins by presenting a series of graphic word pictures, taken from the writings of several observers, of the local conditions existing in the early part of the century, and presents in a concrete form the successive steps in the movement towards reform, with a wealth of illustration which still stands alone in the history of local sanitary effort.

In the portion selected for reproduction, in the present chapter, the narrative is brought down to the sixties decade, in which definite sanitary progress may be said to have begun.

The text, as now reproduced, is taken *verbatim* from the original.—(Ed.)

THE EVOLUTION OF SANITARY ADMINISTRATION IN GLASGOW.

1800-1854.

Population.[1]

1801, - -	83,805.	1831, - -	202,426.
1811, - -	110,460.	1841, - -	280,602.
1821, - -	147,043.	1851, - -	347,001.

	SANITATION.		HEALTH.
1800.	*First Police Act.*[2]		
1806.	The Glasgow Waterworks Company constituted. Works, Dalmarnock. Clyde Water.		
1807.	*Second Police Act.*		
1808.	The Cranstonhill Waterworks Company Constituted. Clyde Water.		
		1818.	Typhus Epidemic.
1821.	*Third Police Act.*		
1830.	*Fourth do.*		
1832.	The Cholera Acts.	1832.	Do. First Cholera Epidemic—2842 deaths, or 14 per 1000. Death rate, 46.
1837.	*Fifth Police Act.*	1837.	Typhus Epidemic—2180 deaths. Death-rate, 41.
1838.	Amalgamation of the two Water Companies.		
1843.	*Sixth Police Act.*	1843.	Relapsing Fever Epidemic—1398 deaths. Death-rate, 32.
1846.	*Seventh Police and Extension Act.*		
,,	Nuisance Removal (Scotland) Act.		
		1847.	Typhus Epidemic—4346 deaths. Death-rate, 56.
1848.	Gravitation Water introduced to Gorbals by Private Company (February).	1848-9.	Second Cholera Epidemic—3772 deaths in 1849, or 11 per 1000. Death-rate, 35.
		1851-2.	Typhus Epidemic.
1854.	Scotch Registration Act.	1853-4.	Third Cholera Epidemic—3885 deaths in 1854, or 12 per 1000. Death-rate, 42.

---

[1] The populations here given are the census populations of Glasgow and Suburbs within the area adopted in 1821 for the Bills of Mortality referred to in the text (Ed.).

[2] Local Acts are printed in *Italics ;* Imperial in Small Capitals.

Prior to 1855, the register of burials kept by the wardens of church-yards was the only source of information as to the number of deaths or their causes. "Mortality Bills" made up from these sources were systematically published from 1821, and from 1832 a succession of able statisticians issued annual reports, which kept vividly before the community the facts so far as known regarding the prevalent causes of death. What these facts were may be very shortly stated. The city was devastated with epidemics of "Fever" and Small-pox. Though Typhus did not arrest attention by any epidemic prevalence until 1818, it was in the city from the very beginning of the century. Its subsequent history was that of an active volcano, periods of deceptive repose alternating with violent eruptions. For short intervals it smouldered in the wynds. When the steady influx of immigrants, attracted by the prospect of work, had reproduced a susceptible population, it burst out into an epidemic. Small-pox, though warded off from the infant population by the early introduction of Jenner's discovery, was scarcely ever entirely absent, apparently feeding chiefly on the Celtic immigrants, and becoming epidemic at intervals as they accumulated. There were three severe epidemics of Cholera in this period—the first in 1832, the second in 1848-9, the third in 1853-4. An outbreak of Relapsing Fever in 1843 attacked more than a quarter of the inhabitants of the poorer districts. Underneath these periodic eruptions flowed a continuous condition of ill-health, which represented the chronic as the former represented the periodic results of precisely the same physical circumstances in the environment of the population.

It is difficult to convey to the present generation any adequate conception of what such varied recurrent epidemics meant in the experience of their forefathers. An attempt may be made so far as figures will go. In 1837 the population of Glasgow was 253,000, the death-rate was 41 per 1000, the number of deaths from "Fever" was 2180, or 8.6 per 1000. It was estimated that at least 21,800 persons suffered from the disease that year. In 1847 the population of Glasgow was 320,470, the death-rate was 56.4 per 1000, the number of deaths from "Fever" was 4346, or 10.4 per 1000, representing in cases some 45,000 persons.[1] If every case now treated in our Hospitals was one of Typhus they would only feebly represent the number of typhus patients pressing for admission to the Infirmary and Parochial Fever Wards of those days. Inside these gaunt figures there are the recurrent panics, the spasms of lavish expenditure, as barren of real profit as the costs of war, the burials to be defrayed by the public, the widows and orphans to support, the lives of medical men, of clergymen, and of nurses annually lost.

---

[1] The worst epidemic year of recent years was 1901, in which the population of Glasgow was 761,712; the general death-rate, 20·6; the number of deaths from "fever," 220; the number of cases of "fevers" notifiable, 1385; and the number of deaths from all infections diseases, 3416, or 4·4 per 1000 living. The total number of cases of infectious diseases registered during the year was 21,145, or less than the number believed to have suffered from "Typhus" fever alone in 1837 (Ed.).

It is interesting and important to note what was said by the contemporaries of these events as to their causes and done for their prevention. The pamphlet literature is considerable and the medical part of it very out-spoken. From the advice given as to what ought to be done, we can at least learn what had not hitherto been done. We have also reports upon the sanitary condition of Glasgow, made from time to time by Royal Commissioners and others, who weighed with a sense of official responsibility what they wrote. The following are quotations from a few of the more striking of these testimonies arranged in chronological order :—

1818.—Dr. Robert Graham, Regius Professor of Botany in the University.[1]

"If any man wonders at the prevalence of continued fever among the lower classes in Glasgow, or at its spreading from their habitations, let him take the walk which I did to-day with Mr. Angus, one of the district surgeons. Let him pick his steps among every species of disgusting filth, through a long alley, from four to five feet wide, flanked by houses five floors high, with here and there an opening for a pool of water, from which there is no drain, and in which all the nuisances of the neighbourhood are deposited in endless succession, to float and putrify and waste away in noxious gases. Let him look as he goes along into the cellars which open into this lane, and he will probably find lodged, in alternate habitations, which are no way distinguished in their exterior, and very little by the furniture which is within them, pigs, cows, and human beings which can scarcely be recognised till brought to the light, or, till the eyes of the visitant get accustomed to the smoke and gloom of the cellar in which they live. I have been to-day in several dens of this kind, where I did not see persons lying on the floor near me, till Mr. Angus, whom a previous visit had taught where to find them, inquired after their health. I was in one closet, measuring twelve feet by less than five, on the floor of which he told me six people had lain, affected with fever, within these two days, and where I saw the seventh inhabitant now confined. We found in one lodging-house, fifteen feet long by nine feet from the front of the beds to the opposite wall, that fifteen people were sometimes accommodated; and when we expressed horror at the situation in which they were placed, the woman of the house, somewhat offended, and, I believe, a little alarmed lest we should cause some enquiry to be made by the police, said, in support of the character of her establishment, that *each family* was provided with *a bed*, and that she very seldom had anybody lying on the floor. I shall only mention one other instance of misery. In a lodging-house consisting of two rooms, separated by boards, the first thirteen feet by eleven, the other fifteen by eight, twenty-three of the lowest class of Irish were lately lodged. To-day there are fourteen, of whom two are confined with fever, three are convalescent, and one only has hitherto escaped. There are only three beds in this house (denominated with that facetiousness which enables an Irishman to joke with his own misery, Flea Barracks)[1] — one of them in a press half-way up the wall, the others wooden frames, on which are laid some shavings of wood, scantily covered with dirty rags. Most of the patients were lying on the floor. A man, two sons, and an adult daughter, were lying side by side on the floor of the first room, their bedding of the same materials with the others, and the boys being destitute of shirts. Could imagination feign a combination of circumstances more horribly conducive to disease and immorality?

---

[1] Practical Observations on Continued Fever, especially that form at present existing as an Epidemic, with some Remarks on the most efficient plans for its suppression. Glasgow, 1818.

* * * * * *

"An important step towards ventilation would be effected, if we could even open up the lanes in which the lower classes live. In Glasgow, the hovels which they inhabit are collected into dense masses of very great size between some of the larger streets. I believe it would greatly add to the healthiness of the place, if some improvements which I have heard talked of were effected, and straight and wide streets carried in different directions through these depositaries of wretchedness. It would not, I think, be easy to devise a more judicious charity, than the building of houses for the poor on an approved plan, and in a good situation. . . . However difficult it might be found to effect a proper ventilation of the houses of the poor, the crowding of these may surely in many cases at least be prevented by the police. Perhaps it might be thought a strong measure to enter a man's house, and regulate the accommodation of his family, even though public good seemed to require it, but I should conceive that lodging houses are strictly under the cognizance of the police, and that the Magistrates are quite entitled to license these, and to put them under regulation. . . . With regard to lessening of some of the circumstances which favour the action of contagion; I am confident the police can and ought to do a great deal. They can compel the removal of the dunghills, or the filling up of the ground on which they stand, so that they may no longer remain a pool of stagnant filth; they can renew the pavement in the closes, giving them all an inclination towards the street, so that the water may not stagnate in them; or, if this cannot be done, they may put drains in them, to carry the water to the common sewer; they can compel the cleaning of the closes by the inhabitants themselves, which can be no difficult task, as almost everywhere there is one, and sometimes two water-pipes in these places. I believe the flooding of the kennels in the closes once every day, and the removal of the multiplied nuisances with which they abound, would go further than is generally supposed in the prevention of contagion."

---

[1] "I then [1815 or 1816] left Lady Marshall's Close, and came to the foot of the Old Wynd, and took lodgings in a celebrated spot called the 'Flea Barracks.' This place was on a ground floor, *near a dung-heap*. It was kept by an Irish woman. . . . The Flea Barracks, to my knowledge, have been the resort of all sorts of bad characters for the last thirty years." "Hawkie," in his Autobiography, written in Town's Hospital, 1840-50. Glasgow, David Robertson, 1888.

1837.—Dr. Cowan, Professor of Medical Jurisprudence in the University.[1]

"Many of the causes of the production and propagation of Fever must be ascribed to the habits of our population; to the total want of cleanliness among the lower orders of the community; to the absence of ventilation in the more densely peopled districts; and to the accumulation, for weeks or months together, of filth of every description in our public and private dunghills; to the over-crowded state of the lodging-houses resorted to by the lowest classes; and to many other circumstances unnecessary to mention.

"Before the Municipal Bill for Glasgow is presented to the Legislature, a well-digested system of medical police should be drawn up and incorporated with the other necessary enactments. Power should be vested in the police to enforce the daily removal of filth of every description. Public water-closets should be established, and every measure calculated to promote the general health rigidly enforced.

* * * * * *

"A few thousand pounds, judiciously expended in opening up the districts most densely populated, and in other obvious ways, would greatly tend to alleviate the pressure of our heaviest municipal tax—the 'fever tax.'"

1838.—J. C. Symons, Assistant Commissioner on the Condition of Handloom Weavers.[2]

"These districts [the low districts of Glasgow] contain a motley population, consisting in almost all the lower branches of occupation, but chiefly of a community whose sole means of subsistence consists in plunder and prostitution. Under the escort of that vigilant Officer, Captain Miller, the superintendent of the Glasgow Police, I have four times visited these districts, once in the morning and three times at night; I have seen human degradation in some of its worst phases, both in England and abroad, but I can advisedly say, that I did not believe, until I visited the wynds of Glasgow, that so large an amount of filth, crime, misery, and disease existed on one spot in any civilised country. The wynds consist of long lanes, so narrow that a cart could with difficulty pass along them; out of these open the 'closes,' which are courts about fifteen or twenty feet square, round which the houses, mostly of three storeys high, are built; the centre of the court is the dunghill, which probably is the most lucrative part of the estate to the laird in most instances, and which it would consequently be esteemed an invasion of the rights of property to remove. . . . In the lower lodging-houses, ten, twelve, and sometimes twenty persons, of both sexes and all ages, sleep promiscuously on the floor in different degrees of nakedness. These places are generally, as regards dirt, damp, and decay, such as no person of common humanity would stable his horse in.

---

[1] Statistics of Fever and Small-pox in Glasgow. Read to Statistical Society of Glasgow, 1837.

[2] Reports from Assistant Handloom Weavers Commissioners, Parliamentary Paper, issued 27th March, 1839.

"Many of the worst houses are dilapidated and in a dangerous state, and are condemned by the Dean of Guild Court, a sentence of which the execution appears to be generally postponed, and which renders these abodes doubly desirable to the occupants, as the passing of sentence prevents the levy of rent.

* * * * * *

"I visited the parts of Edinburgh likewise, where the lowest portion of the community reside, but nothing which can for a moment be compared with the wynds of Glasgow exists there. It is my firm belief that penury, dirt, misery, drunkenness, disease, and crime culminate in Glasgow to a pitch unparalleled in Great Britain."

1839.—Henry Paul, a Magistrate of the City.[1]

"No one at all acquainted with the state of many of the Lanes and Closes of this City, and of the miserable lodging-houses with which these abound, can be astonished at the extent to which Fever often prevails among our population. Having had occasion, in the discharge of official duty as a magistrate, to visit many of these dwellings, I can unhesitatingly declare that the scenes which have been presented, few could have imagined to exist, and, in my humble judgment, a better state of things will never be brought to take place, until many of the loathsome hovels of the poor be entirely removed, and until a more free and properly ventilated atmosphere be introduced into their dwellings. How this can be best and most effectually accomplished, I shall not now presume to determine, but it is assuredly a subject well entitled to the best consideration of those who feel an interest in the prosperity of our City, and in the general health and comfort of our citizens."

1840.—Captain Miller, Chief Constable of the City.[2]

"*Health.*—In the very centre of the city there is an accumulated mass of squalid wretchedness, which is probably unequalled in any other town in the British dominions. In the interior part of the square, bounded on the east by Saltmarket, on the west by Stockwell Street, on the north by Trongate, and on the south by the river, and also in certain parts of the east-side of High Street, including the Venals, Havannah, and Burnside, there is concentrated everything that is wretched, dissolute, loathsome, and pestilential. These places are filled by a population of many thousands of miserable creatures. The houses are unfit even for styes, and every apartment is filled with a promiscuous crowd of men, women, and children, all in the most revolting state of filth and squalor. In many of the houses there is scarcely any ventilation, and, from the extremely defective sewerage, filth of every kind constantly accumulates."

---

[1] The Glasgow Mortality Bill for the year ending 31st December, 1838.

[2] Proceedings British Association—Glasgow Meeting, 1840, paper "On the State of Crime within the Glasgow and City Police Jurisdiction," p. 170.

1840.—Dr. Neil Arnott—Official Report to Poor Law Commissioners.[1]

"In Glasgow it was found that the great mass of the fever cases occurred in the low wynds and dirty narrow streets and courts in which, because lodging was there cheapest, the poorest and most destitute naturally had their abodes. From one such locality, between Argyle-street and the river, 754 of about 5000 cases of fever, which occurred in the previous year, were carried to the hospitals. In a perambulation on the morning of September 24th, with Mr. Chadwick, Dr. Alison, Dr. Cowan (since deceased, who had laboured so meritoriously to alleviate the misery of the poor in Glasgow), the Police Magistrate, and others, we examined these wynds, and, to give an idea of the whole vicinity, I may state as follows:—

"We entered a dirty low passage like a house door, which led from the street through the first house to a square court immediately behind, which court, with the exception of a narrow path around it leading to another long passage through a second house, was occupied entirely as a dung receptacle of the most disgusting kind. Beyond this court the second passage led to a second square court, occupied in the same way by its dunghill; and from this court there was yet a third passage leading to a third court, and third dungheap. There was no privies or drains there, and the dungheaps received all filth which the swarm of wretched inhabitants could give; and we learned that a considerable part of the rent of the houses was paid by the produce of the dungheaps. Thus, worse off than wild animals, many of which withdraw to a distance and conceal their ordure, the dwellers in these courts had converted their shame into a kind of money by which their lodging was to be paid. The interiors of these houses and their inmates corresponded with the exteriors.

* * * * * *

"Several intelligent inhabitants of Glasgow stated that they were persuaded, if any capitalists would buy the ground of these wynds, and pull down the houses to substitute better houses in wide streets, with good drainage, the increased rental would make the speculation, even to them, very profitable, while the saving to the community of the cost of supporting the wretched widows and orphans of men who die of the disease generated in the place would exceed the amount of any rent which the property could produce."

---

[1] Reports on the Sanitary Condition of the Labouring Population of Scotland, in consequence of an Enquiry directed to be made by the Poor Law Commissioners. Presented to Parliament, July, 1842.

1842.—Mr. Chadwick, Secretary to the Poor Law Commissioners.[1]

"It might admit of dispute, but, on the whole, it appeared to us that both the structural arrangements and the condition of the population of Glasgow was the worst of any we had seen in any part of Great Britain."

1843.—The District Surgeons of the Parishes of Glasgow.[2]

[In preparation for his paper on the Sanitary State of Glasgow in relation to the Epidemic of Relapsing Fever in 1843, Dr. Perry asked the District Surgeons to write reports on the state of their districts. He printed those reports as an Appendix to his paper, and, referring to it, says he "*earnestly recommended to our civic authorities the careful perusal of these reports. From them they will learn the state of danger in which we live, if matters are allowed to continue as they are.*" They preserve what is in fact a description as detailed as a directory of the Closes and Wynds as they were seen in 1843 by those men in the course of their professional duties. A few extracts are given as a sample.]

District II.—Dr. Kennedy.

"All the closes in the Bridgegate, from Merchant Lane to Market Lane, are kept in a most abominable manner. I may particularly mention 101 or Miller's Close, 95 or Mitchell's Close, 87 or Glue and Size Close, 81 or Marshall's Close, 71, 65 or Scanlan's Close; but if a prize were to be given for abominations of all kinds, Miller's Close deserves it. . . . The next worst part of my district is that part of west side of Saltmarket, extending from Bridgegate up to Princes Street. The closes are all thickly peopled and kept in a most disgraceful state."

District IV.—Dr. D. Smith.

[To the East of Saltmarket.]

"The tenements in which I have visited are occupied from the cellars to the attics, and almost altogether kept for lodging-houses, many of them being more fit for pig-styes than dwellings for human beings; and in not a few the donkey and the pigs rest at night in the same apartment with the family. The entrance to these abodes is generally through a close, not unfrequently some inches deep with water or mud, or the fluid part of every kind of fifth, carelessly thrown down from unwillingness to go with it to the common receptacles; and in every close there is at least one of these places, situated often immediately under the windows of the dwelling-houses, or together with byres, stables, etc., forming the ground floor, while the stench arising therefrom in summer pollutes the neighbourhood, and more especially renders the habitations above almost intolerable. The beds are variously constructed, some being merely a portion of the floor divided by a piece of wood kept in its place with stones or brick, . . . in other cases the beds are formed in tiers over each other, as in the steerage of an emigrant ship. . . . Need I add to this, that the inhabitants with whom I have to deal are of the very lowest ranks in society; a few of them are labourers, but the greater majority are hawkers and beggars, thieves and prostitutes. At night whole families sleep in one bed; and as there are several beds in each apartment, several families are made to occupy it. . . . In short, of the moral degradation, grossness and misery of those people, no adequate description can be given; and few, very few indeed, besides the District Surgeons know the actual condition of the pauper population of Glasgow. The Highland Close, Jefferies' Close, and Todd's Close enter from off Goosedubbs, there fever has prevailed to a fearful degree, and all these places abound in filth; are overcrowded with inhabitants, the lowest of our pauper population."

---

[1] Report of Poor Law Commissioners on an Enquiry into the Sanitary Condition of the Labouring Population of Great Britain. Presented to Parliament, July, 1842.

[2] Facts and Observations on the Sanitary State of Glasgow during the last year, etc., by Robert Perry, M.D., with an Appendix containing Reports from the District Surgeons. Glasgow, 1844.

District XI.—Dr. Brown.

[Between New Vennel and Duke Street, High Street, and the Molindinar. Population, 5300. Attended 1700 cases in twelve months! Chiefly inhabited by thieves and prostitutes. Only a sentence here and there can be quoted.]

"64 Havannah Street is not surpassed by any close in the city for filth, misery, crime, and disease; it contains 59 houses, all inhabited by a most wretched class of individuals; several of these houses do not exceed 5 feet square, yet they are forced to contain a family of sometimes six persons. . . . 105 Havannah Street was an old Carpet Factory, lately arranged into 36 cells about 7 feet square, . . . comfort, convenience, and ventilation kept out of sight; there is scarcely a bed in the whole land but what was supplied by me from the Town's Hospital. As might be supposed, fever raged dreadfully here; . . . the whole furniture is not worth a week's rent; the cellars behind are converted into houses of the worst description. . . . The whole of the Burnside, especially the ground floors, are not fit places for pigs; height of ceiling 6 feet, and at almost every flood in the Clyde they are inundated by the Molindinar Burn; every inhabitant of these dens has had fever; it literally swarms with prostitutes of the lowest class."

District XII.—Dr. Fisher.

[Between Candleriggs and High Street, north of Trongate.]

"This space forms part of a district of this great city which, in the opinion of one capable of judging of the subject, contains a greater amount of human degradation, both moral and physical, than is to be found in any corresponding space of the Kingdom of Great Britain. I do not think him wrong, for I cannot conceive of human beings more sunk in vice, or labouring under a heavier load of misery than are the wretched inhabitants of the part to which I refer. . . . No. 75 High Street, a very dirty close, abounding in low Irish Lodging-houses. The floors of the houses in the ground flats are damp and dirty, in fact little better than cellars. The upper part of the close is very filthy. The lower flat of one of the houses here was lately appropriated to the breeding of swine, while several families occupied the flats above. The part of the close at the side of the house is used as a dunghill, which renders access to it by no means either pleasant or easy. I believe every inhabitant of this tenement has had fever. Upwards of 120 cases occurred in the close. . . . No. 83, a very filthy close. . . . No. 93, or Pipehouse Close, is the filthiest in the district. . . . No. 13 Bell Street, a dirty close, with a dunghill at the head of it. . . . No. 23, a long dirty close. In one house at the top of it several severe cases occurred. Access is obtained to this house, or rather apartment, by an outside stair, by the side of which is a dunghill, the stench from which is intolerable. I have seen the dung reach the landing place on the top of the stair. I attended for fever almost every individual residing in the front land."

DISTRICT XV.—DR. HANNAH.

"The fever showed itself first among the very poorest of the inhabitants, and in the most filthy places, such as the close No. 275 High Street, 46 and 47 Rottenrow, and the adjoining places, where it has ever since prevailed to a great extent."

GORBALS.—DR. STRANG.

"In the back lands of closes 6 and 13 Clyde Terrace not a single family or member of a family has escaped. The inhabitants are . . . very dissipated, and particularly dirty. The tenements in 13 are unfit for any purpose in the shape of habitation. . . . In a lodging-house in Parker's Close (102 Main Street) saw ten individuals lying with the fever at the same time in one apartment, and that den without a window. The Sweep's and Barker's Closes are truly miserable places."

ANDERSTON.—DR. M'EWAN.

"800 cases of the prevailing epidemic have come under my notice in the short period of six months; and these for the most part in the dirtiest districts of this burgh—in ill-ventilated underground cellars and in old houses."

1849.—DR. SUTHERLAND, General Board of Health.[1]

"It is in those frightful abodes of human wretchedness which lay along the High Street, Saltmarket, and Briggate, and constitute the bulk of that district known as the 'Wynds and Closes of Glasgow,' that all sanitary evils exist in perfection. They consist of ranges of narrow closes, only some four or five feet in width, and of great length. The houses are so lofty that the direct light of the sky never reaches a large proportion of the dwellings. The ordinary atmospheric ventilation is impossible. The cleansing, until lately, was most inefficient, and, from structural causes, will always, under existing arrangements, be difficult and expensive. There are large square midden-steads, some of them actually under the houses, and all of them in the immediate vicinity of the windows and doors of human dwellings. These receptacles hold the entire filth and offal of large masses of people and households, until country farmers can be bargained with for their removal. There is no drainage in these neighbourhoods, except in a few cases; and from the want of any means of flushing, the sewers, where they do exist, are extended cesspools polluting the air. So little is house drainage in use, that on one occasion I saw the entire surface of a back yard covered for several inches with green putrid water, although there was a sewer in the close within a few feet into which it might have been drained away. The water-supply is also very defective; such a thing as a household supply is unknown, and I have been informed that, from the state of the law, the water companies find it impossible to recover rates, and that, had the cholera not appeared, it was in contemplation to have cut off the entire supply from this class of property.

---

[1] Report on the Measures adopted for the Relief of Cholera in Glasgow during the Epidemic of 1848-49—Appendix A to a Report of General Board of Health on the Epidemic Cholera of 1848-49.

"The interior of the houses is in perfect keeping with their exterior. The approaches are generally in a state of filthiness beyond belief. The common stairs and passages are often the receptacles of the most disgusting nuisances. The houses themselves are dark, and without the means of ventilation. The walls dilapidated and filthy, and in many cases ruinous. There are no domestic conveniences even in the loftiest tenements, where they are most needed, except a kind of wooden sink placed outside some stair window, and communicating by a square wooden pipe with the surface of the close or court beneath. Down this contrivance, where it does exist, is poured the entire filth of the household or flat to which it belongs, and the solid refuse not unfrequently takes the same direction till the tube becomes obstructed.

* * * * * *

"Another matter connected with these districts, and their peculiar liability to epidemic disease, is the great and continually increasing overcrowding that prevails. I have been credibly informed, that for years a population of many thousands has been annually added to Glasgow by immigration without a single house being built to receive them. The great proportion come from Ireland. Every cabin in that wretched country that is razed to the ground sends one or more families to find house-room in the cities of England and Scotland, and of this element of disease Glasgow obtains its full share.

* * * * * *

"The overcrowding and wretchedness of late years has brought typhus with it, a disease that not long ago was almost as rare in the large Cities of Scotland as ague now is: and wherever typhus has prevailed, there cholera now prevails, or has done so recently."

Many more witnesses might be called, but only to corroborate and repeat those testimonies. It is proved beyond question that a considerable proportion of the population lived in districts in which the houses were so crowded upon the soil as to be beyond the reach of sun or air, and to leave no more space than was necessary for access of the residents to the recesses of those continuous masses of building, that those houses were crowded without consideration either of health or decency, and their inhabitants left uncared for and so shut out from all chance of cleanliness of life as to have reached the lowest depth of physical and moral degradation. The urgency of remedial measures for the clearing out and reconstruction of these localities was persistently pointed out, but not until towards the end of the period under review (1800-1854) was a beginning made and then only a beginning. Under the immediate stimulus of the Cholera of 1848 the Dean of Guild Court began to put in force its power to require houses or buildings which were "insecure, ruinous, or in any other way dangerous to the safety of the inhabitants" to be demolished or repaired. Many of the most disreputable tenements in the wynds of Glasgow proper, and in Calton, Gorbals, and Anderston, were thus dealt with, but it was only because they could hold themselves upright no longer! The special reports of the proceedings of this Court from 1848 to 1851, which appeared in the *Glasgow Herald*, served a most useful educational purpose.[1] Alongside of the petitions of the Procurator-Fiscal for those demolitions came up applications for permission to erect new buildings, which the Court had reluctantly to pass although plainly reproductions of the old. In fact, substantial structures could be erected even on the sites of these condemned buildings so that the encumberment of space was not lessened. The *Herald* pointed to the "Wynds" which were being laid out on the Blythswood and Milton feus and demanded a Building Act. In 1851, the Dean of Guild brought the necessity of such an Act before the Town Council. We are also told by Mr. Carrick that "soon after 1846 the Town Council resolved to set aside the sum of £30,000 for acquiring property in the districts known as the wynds and in the closes abutting on the High Street, the Saltmarket, and in the Gorbals. A large amount of property was thus acquired."[2] Another noteworthy result of those distressful forties was the "Model Lodging Association," got up by large-hearted citizens, which established three large houses, thus anticipating one of the most useful works of the

---

[1] They form the first chapter of vol. 1 of *Glasgow Past and Present*, pp. 1-240, Glasgow, 1884.

[2] *Glasgow Past and Present*, vol. 1, p. xxi.

Improvement Trust by which they were ultimately acquired. When we consider the next period, 1855-64, it will be made evident that all this was a mere scratching of the surface, and that not until 20 years later was anything radical and effectual done.

It is further evident that not merely was the permanent structure of the city bad, but the daily service required to keep the city wholesome in its life was practically neglected—the cleansing, the repairs, the distribution of fresh water, the removal of foul, all the primary duties of civic management were either wholly undone or very imperfectly done. Of sanitation in the modern sense there was none. In the Police Acts passed in 1800, 1807, 1821, 1830, and 1837 there are clauses as to scavenging streets and public places by the authorities, and private closes, &c., by proprietors, but it was not until 1843 that an Inspector of Cleansing was introduced and powers taken "to make regulations for watering, sweeping and cleansing closes, thoroughfares and areas, for the purpose of disinfection and otherwise promoting the health of the inhabitants therein," for the cleansing of common stairs by tenants; for regulating the emptying of middens and privies "according to their dimensions and the local circumstances as regards the health and comfort of the persons in the neighbourhood"; to license Common Lodging-houses, prevent overcrowding, and secure the reporting of fever by the keepers; for carrying out disinfection by the Magistrates through the Police. Altogether this Act marked a considerable advance, but it was chiefly on paper. It provided no special executive machinery, functions were so far defined but, except as regards cleansing, were left as a sort of bye-play to officials appointed primarily for police purposes. Dr. Scott Orr[1] tells us that the great epidemic of 1847 was in full swing before any attempt was made to disinfect either houses or clothing; and Dr. Sutherland[2] testifies to the shameful inefficiency of the general sanitary service in 1849. The filth was a perquisite of the householders and was removed at the convenience of farmers, a system which now exists only in the smallest of villages.

This brings us to the measures adopted for the prevention and control of infectious disease at this period. In the wide and provident sense there were none. Fevers as such were not dealt with preventively, only epidemics. Each epidemic was a tragedy. When it was played out all the properties were dispersed and the stage left unfurnished. We shall deal with the important matter of hospital isolation by itself subsequently. Suffice it to say meanwhile that from its opening in 1794 for 70 years the Royal Infirmary was the centre of every provision for isolation. At one time indeed the managers even disinfected the houses from which they removed fever patients. The usual course of events was the rapid extension of the epidemic until the Infirmary Fever House was overflowing, then public excitement, public meetings, the appointment of a "Fever Committee" or a "Board of Health," as in 1832 and 1837, the collection of funds, a rushing about for sites for temporary hospitals, attendance at home, the organization of a staff of fumigators, &c. Then the disease in due time began to decline; it shrank within the capacity of the Royal Infirmary; the hospitals were pulled down, the doctors, nurses, and fumigators who had not been buried were paid off; a report of the receipts and disbursements was submitted and the Board or Committee ceased to be. The play was over; the old properties were not even stowed away, they were burned.

---

[1] Historical and Statistical Sketch of the Progress of Epidemic Fever in Glasgow during the year 1847. *Edinburgh Medical Journal*, 1848.

[2] Report on the measures adopted for the relief of Cholera in Glasgow during the epidemic of 1848-9, Appendix A to a report of General Board of Health on the Epidemic Cholera of 1848-9.

This evil method was not a feature of the locality. It was the method of the period. This was the fashion of the first instinctive effort at self-protection when the Cholera spectre stalked into the land. The Preamble to the Cholera Acts (English and Scotch) of 1832 is worth quoting, it so vividly exhibits the administrative mind of the time. It runs: "whereas it has pleased Almighty God to visit the United Kingdom with the disease called Cholera, or spasmodic or Indian Cholera, and whereas . . . with the view to prevent as far as possible by the Divine Blessing, the spread of the disease, it may be necessary that rules and regulations should from time to time be established within cities, &c., affected with, or which may be threatened by the said disease, . . . be it enacted that it shall and may be lawful for the Lords and others of H.M. Most Honourable Privy Council . . . to establish, and again from time to time . . . to revoke, renew and alter such rules and regulations as to them may appear necessary or expedient for the prevention of said disease." When we recall the state of Glasgow as described by citizens of her own and of the cities of Great Britain generally so soon to be disclosed by Royal Commissions issued only when Privy Council Orders had dismally failed to "prevent," our wonderment is divided between the mediæval piety of the preamble and the superficial knowledge of the case betrayed by the remedy applied. Both in quality and quantity it miserably fails. Not merely are the rules and regulations spasmodic and temporary, but their purpose is limited to the "relief" of the sufferers and "the safe and speedy interment of those who die." Magistrates were authorised to levy a special assessment for those purposes. Hence, while for Cholera shelters and "sheds," medical attendance, &c., &c., might be provided out of special rates, for "Fever" there was no resource but public subscription and subventions from the common good until the date of the Nuisance Removal Acts. The same method, but with an extended scope, was recognised in these Acts, which encouraged a meagre administration and expenditure during the absence of epidemics and clothed the Privy Council with power by special Order to require local authorities to provide hospitals, deal with overcrowding, purge themselves of nuisances, make domiciliary inspections, and otherwise improvise in the midst of an epidemic what ought to be the work of a sanitary department from year to year.

The most important event of the period under review in relation not merely to public health, but to all the functions of municipal government was the abolition of sectional administration in the community of Glasgow. This was accomplished by the Police and Extension Act of 1846, which brought the Burghs of Calton, Anderston, and Gorbals under one jurisdiction with Glasgow. Hitherto, administration had been parochial rather than municipal in spirit and scope. Divisional administration of what ought to be civic business always is. The sense of corporate life developed slowly in the new municipality; how slowly in respect of public health we shall see further on. Every successive "Fever Committee" and "Board of Health" touched the consciences and actuated the brains of some of the citizen members and gave them glimpses of a larger policy, which remained after the occasion had passed by. The leading medical men, among whom Graham, Miller, Cowan, Watt, and Perry deserve honourable mention, drew from the bitter experience of their time administrative lessons which it took the municipality long years to learn, but which even now we can scarcely be said to have improved upon in practice. By refined methods physiologists have been able to measure the intervals which elapse between the stages of perception and volition in the brain and action at the circumference. This history gives us many opportunities of measuring in like manner the inertia of the civic mind by noting the length of time which intervenes between the clear formulation of a policy and its adoption. In 1842, there was published a "Report on the legal provisions available in Glasgow for the removal of Nuisances," drawn up at the request of the Poor Law Commissioners by Mr. Chas. R. Baird, an eminent local lawyer. He had acted as secretary of the

Glasgow Relief Fund in 1837. He had been a member of the Board of Health. He was satisfied, and he believed the majority of his fellow-citizens were satisfied, that, if not for all municipal purposes, for *sanitary* purposes at any rate, Glasgow and its suburbs ought to be under one jurisdiction. He outlines the constitution of a "Sanitary Commission or Board of Health," with executive medical and inspecting staff and power of assessment, to be responsible for the care of the public health throughout this area. Further, he details the purposes which such a Board ought to have legal powers to accomplish. Here was the idea of differentiating sanitary from other municipal functions, and even now one could scarcely desire a more satisfactory synopsis of the scope of the duty of such a special executive. It was twenty years before the idea was carried out in Glasgow, and the legal powers were only sought and obtained from time to time over a longer period.

The Scotch Registration Act took effect in 1855, so that 1855 to 1864 covers the first decade of unquestionable statistics. Glasgow entered upon this period under the impulse to practical sanitation of her third Cholera Epidemic, 1853-4. The first result was the passing of the Corporation Water Works Act in 1855, which authorised new works, and took over the undertakings of the two private companies, which had hitherto purveyed water to the community. One of these derived its water from the Clyde. This source was abandoned in October, 1859, when water from Loch Katrine was substituted; one of the most important events in the sanitary history of Glasgow.

In 1857 a "Committee on Nuisances" was appointed, and for the first time Public Health was differentiated as a special function of municipal government. This was done under the Nuisance Removal (Scotland) Act. In 1859 the Chairman (Mr. John Ure[1]) submitted a scheme for the improvement of the sanitary condition of the city by creating a special department under a medical officer with an adequate staff of inspectors for the discovery of nuisances and the oversight of disease, the whole to be under the Committee. The Town Council resolved to send Mr. Ure and another Councillor (Mr. Moir) with the Chief Constable and Master of Works (Messrs. Smart and Carrick) as a deputation through the chief towns of the United Kingdom to get information as to local organization and powers. They visited London, Leicester, Birmingham, Manchester, Liverpool, Edinburgh, Dundee, Aberdeen, Dublin, and Belfast. They reported in October. They found that while the sanitary condition of Glasgow might not be excelled in

---

[1] Afterwards Lord Provost (1880-3) and LL.D. (Hon. Causa), Glasgow University, 1896.

Scotland or Ireland, it was greatly surpassed in England, a result which, allowing for "the more cleanly habits of the English working-classes" and the different style of building, they thought was "undoubtedly also attributable to the extensive powers possessed by the local authorities, the thorough organisation of their sanitary departments, and the enforcement of their sanitary regulations." They found great defects in the local powers. They recommended that these should be extended and defined, and submitted their suggestions in detail. These were carefully considered by a special Committee; and ultimately Mr. Ure's scheme for the organization of a Sanitary Department was adopted. The notes made by the deputation of the powers desired for regulating new buildings, for dealing with nuisances, with overcrowding, with cellar-dwellings, with conveniences, water-supply, &c., &c., for cleansing, for erecting baths and wash-houses, &c., were put into the hands of the

1855-1864.

Mean Population, 387,515.

SANITATION.

1855. *Corporation Water Works Act.*
1856. Amended Nuisance Removal (Scotland) Act.
1857. "Committee on Nuisances" (March).
1859. Loch Katrine Water turned on (October).
,, *Parks and Galleries Act.*
1862. *Eighth Police Act.*
,, "Sanitary Committee" (November).
1863. First Medical Officer of Health (January).
,, Suppression of overcrowding by ticketing Houses begun.
1864. First Municipal Disinfection and Washing-house (September).
,, Scotch Vaccination Act came into force (1st Jan.).
,, First "Sanitary Office" opened (December).

HEALTH.

	Deaths.	
	Typhus.	Small-pox.
1855,	460	203
1856,	439	127
1857,	549	399
1858,	504	113
1859,	381	201
1860,	408	347
1861,	475	131
1862,	533	27
1863,	671	349
1864,	1138	300

Ten Years, 1855-64.

Birth-rate,	41
Death-rate,	30
Highest Death-rate (1864),	32·5
Lowest ,, (1861),	27·5
Death-rate under 1 per 1000 born,	171
Death-rate, Zymotic Diseases,	7·8

Committee in charge of the New Police Bill, and thus formed the draft of the clauses dealing with these and the like matters in the Glasgow Police Act of 1862. Apart from the temporizing method of dealing with infectious diseases, the great defect of this Act was looseness as to the executive officers, their appointment, and the allocation of their functions. The appointment of "one or more medical officers" was obligatory, but that of "one or more inspectors of nuisances" was permissive, while most elastic methods of manipulating functions by distribution over various officials having primary duties of another kind were left at discretion. The duties of nuisance inspector and of common lodging-house inspector might be discharged by the Chief Constable or any of his superintendents or lieutenants, or by the Master of Works, who might also be Inspector of Cleansing and of Lighting. There being no provision for permanent hospitals, the removal of infectious disease from Common Lodging-houses is managed by a compulsitor on inspectors of poor. Notwithstanding these criticisms from the standpoint of thirty years of evolution, this Act in its day marked a great stride in advance of local sanitary legislation.

Immediately on the passing of the 1862 Act, a "Sanitary Committee" was nominated (Chairman, Mr. Ure). In January, 1863, the first Medical Officer of Health was appointed (Dr. W. T. Gairdner), with the five District Surgeons of Police as his assistants (Drs. MacGill, Dunlop, Renfrew, Young, and Johnston). In March a "special non-medical inspector" (Mr. George MacKay, now Chief Sanitary Inspector to the County of Perth) represented in his solitary person the "sanitary staff." He had a desk in the room in the Central Police Buildings used by Dr. MacGill in his capacity as Surgeon to the Police Force—a place measuring 15 feet by 10, which, if a one-room house, would now-a-days be ticketed for four inmates! This was the FIRST SANITARY OFFICE. All communications regarding infectious disease were requested to be addressed—"Inspector of Epidemic Disease, Central Police Office, 9 South Albion Street."

The Medical Officer and his pigmy staff found themselves immersed in a rapidly rising flood of Typhus. Since 1847 there had been no epidemic which, judged by the standard of those days, would be designated "great." Yet the disease was never for a day idle. In 1859 it touched the lowest point of prevalence; it carried off only 381 people. But its tribute was advanced steadily year by year until in 1864 it rose to 1138, and in 1865 to 1177. As usual nothing had been done to prepare for the evil day, still less to avert it. The fever-flood ebbed and flowed, its movements registered by the capacity of the Infirmary fever-house, and remarked upon with gratification when the permanent wards were sufficient; with anxiety when they were full. Dr. Gairdner was in the position of a Commander-in-Chief newly appointed; an active enemy swarming over the land, holding every strategetical point, well-found and well-equipped, while he possessed nothing but his commission. He had to recruit and drill and equip his army, to subsidize mercenaries, to bear a brave front, and make the most of his meagre resources. In January, 1864, three "non-medical officers, selected from the Police Force for special sanitary duty," were added to the staff, and, shortly after, two shops (59-61 College Street) were fitted up as a "Sanitary Office" at a rent of £25. In September, the first Municipal Disinfecting and Washing-house was established (66 High Street). The ground rent was £5, and the cost of erection and fittings, £244! A staff for fumigating and lime-washing infected houses was organized and placed, with the washing-house, under the Inspector of Cleansing. As the year advanced into winter the usual difficulty of hospital accommodation arose. Conferences were held between the Managers of the Royal Infirmary, the Parochial Boards, and the Police Board with their Medical Officer.[1] The Board resolved to provide temporary accommodation under the 1862 Act. Many offers were made for adaptable existing buildings, and at last a willing proprietor of a disused mill in Anderston was discovered. But the moment the proposal became public it excited the neighbourhood into an opposition which was frantic in its threats and impossible to withstand. There was nothing for it but to build, and a site was purchased in the neighbourhood of St. Rollox where, amid deep snow, a beginning was made, and a pavilion hospital of wood on brick foundations was erected, furnished, and opened with 136 beds on 25th April, 1865—*the first Municipal Fever Hospital.*

Glasgow had now the rudiments of a Sanitary Department; nothing more. What was wanted, and what unhappily was not possessed at first, was a proper conception of the nature of the functions of such a department. As already stated, a totally erroneous and mischievous suggestion was kept before local authorities by the Nuisance Removal Acts. The chronic nuisance was allowed to fester; the solitary case of infectious disease to propagate its kind unmolested until the supreme moment of epidemic prevalence had arrived. Forthwith issued the "Order in Council," and the local authority was clothed with extraordinary powers and quickened to spasmodic energy. House-to-house visitation was begun, overcrowding was put down, the scavenger sallied forth with his broom, the lime-washer with his brush, temporary hospitals were run up, and medicines were dispensed. Not unnaturally, Glasgow in the 1862 Act adopted this principle in a modified form, the authorities assuming to themselves the right to proclaim

---

[1] In Scotland as in England the first Sanitary Acts aimed at the removal of conditions obviously associated with disease, and left the provision for the treatment of the infectious diseases a question of Poor Law relief, just as many Parish Councils are now providing Sanatoria for the consumptive poor, not as a question of public health, but as one of poor relief (ED.).

1865-1874.

Mean Population, 468,263.

SANITATION.		HEALTH.			
			Deaths.		
			Typhus.	Small-pox.	
1865.	First Municipal Fever Hospital.	1865, -	1177	26	
,,	*Market and Slaughter-houses Act.*				
1866.	*Ninth Police Act.*	1866, -	596	104	Fourth and last Cholera Epidemic—only 68 deaths.
,,	*City Improvements Act.*				
,,	Cattle Sheds in Burghs (Scotland) Act.				
1867.	Scotch Public Health Act.	1867, -	497	32	
1868.	Cleansing assumed by City as a Special Department under a Committee.	1868, -	367	3	
		1869, -	970	2	
1870.	"Committee on Health."	1870, -	544	25	Epidemic of Relapsing Fever.
,,	First Sanitary Inspector.				
,,	Sanitary Department Organized.				
,,	Estate of Belvidere acquired for Hospital purposes (November).				
,,	14 Intra-mural Burial-grounds closed.				
1870-77.	Improvement Trust Demolitions and Reconstructions.				
1871.	New Washing and Disinfecting House at Belvidere.	1871, -	284	184	
,,	*Improvement Act Amendment Act.*				
1872.	First Reception House opened (June).	1872, -	182	149	
,,	Scotch Education Act.				
1873.	Permanent Vaccination Station opened (January).	1873, -	68	228	Milk Epidemic of Enteric.
,,	*Streets Improvement Act.*				
1874.	System of Co-operation with School Board to prevent dissemination of infectious disease through Schools (September).	1874, -	113	214	

Four Years, 1871-74.

7 Articles washed, &c., per case of infectious disease registered.

10 "Nuisances" removed per annum per 100 houses inhabited.

Ten Years, 1865-74.

Birth-rate, - - - -	40·5
Death-rate, - - - -	30·5
Highest Death-rate (1869), -	33·7
Lowest Deate-rate (1867). -	28·2
Death-rate under 1 year per 1000 born, - - - -	167
Death-rate, Zymotic Diseases	7·4

"districts, streets, or courts," upon the report of their own medical officer, "that epidemic, endemic, or contagious disease prevails or exists and threatens to prevail." Hence everything the new department did, its own constitution and executive, its functions, its hospital and washing-house, bore the mark of temporary emergency. All these extraordinary powers were exercised through the Magistrates' Committee, not through the Sanitary Committee. The work of a sanitary department must be uniform and continuous, not spasmodic and cataclysmal. Fortunately the 1862 Act was operative for only five years, the experiences of which were sufficient to teach the true method. In the 1866 Act the authorities bound themselves to erect and maintain hospitals and washing-houses, and to appoint a chief sanitary inspector and subordinate sanitary staff. For the power to compel inspectors of poor to remove fever cases from Common Lodging-houses, they substituted compulsory removal to their own hospital. Between the local Act and the general Public Health (Scotland) Act, passed next year, Glasgow found itself in a position to develop a permanent sanitary department and commence the daily routine of the sanitary function, undisturbed by a perpetually impending dissolution. The most difficult task of the new department was the recovery of its work from the Police, the Master of Works, and the Inspector of Cleansing.

In 1870 the first Sanitary Inspector was appointed (Mr. Macleod). The staff at 69 College Street had, since 1864, been increased to nine (1 Indoor, 2 Nuisance, and 6 Epidemic and Common Lodging-house Inspectors), but this was recognised to be inadequate, especially for the discovery and removal of nuisances. The whole system was expanded and remodelled, taking the five Police Districts as the units of administration. The subordinate staff was thus at once raised to 42, exclusive of clerks. There were five Female Sanitary Inspectors among the number, which was then a novelty. New premises were taken (1 Montrose Street[1]). The only subsequent changes of importance in the executive, apart from the steady increase in the strength of the rank and file, were the concentration of the medical function in one Medical Officer of Health, devoting his whole time to the work (November, 1872), and the appointment of a junior Medical Officer in 1892. An important administrative improvement was effected by the combination of the "Sanitary Committee" and the "Cleansing Committee" in the "Committee on Health," with two standing Sub-Committees, "Hospitals" and "Cleansing." Under this last the whole cleansing of the City, which had in 1868 been organised under a Cleansing Department, instead of being carried out by contractors, was placed and so brought into close sympathy with the purposes of health, in place of being carried on as a gigantic manure business, to be judged solely by its ledger balance. This was, therefore, a memorable year in the evolution of system in the performance of the health functions of municipal government in Glasgow. It was also noteworthy for the acquisition, under pressure of the necessities of an epidemic of Relapsing Fever of the Belvidere[1] estate, which has since become known over the world as the site of the largest Fever Hospital out of London, and, probably, taking natural beauty along with design and equipment, the finest in the three kingdoms. In 1871 the primitive washing-house in High Street was abandoned for a more commodious and better equipped establishment at Belvidere.

---

[1] The development of the Sanitary Department is well shown by the advance in the rent of the premises with each successive addition to the accommodation :

1864, 59-61 College Street, £25.
1870, 1 Montrose Street, £180.
1874, 1 Montrose Street and 120 Ingram Street, £250.
1886, 1 Montrose Street and 120-122 Ingram Street, £290.
1890, 1 Montrose Street and 120-122 Ingram Street (whole of two flats) £340, with two sub-offices—at Crosshill, £21, and Hillhead, £25.
Now, 1895, premises are in course of erection which will cost £17,000, exclusive of site.

City Improvements Act, 1866.—This period includes another epoch-making event. In the same year, 1866, in which the Police Act of 1862 was revised and re-enacted the City Improvements Act was passed. We have quoted at length contemporary descriptions of the Wynds and Closes of Glasgow from 1818 down to 1849. We have stated that after the Cholera epidemic of 1848 they received some attention from the Dean of Guild Court and Town Council. By demolitions here and there, and by greater attention to paving, scavenging, and the position and structure of conveniences, no doubt some improvement was effected. The meeting of the Social Science Association in Glasgow in 1860 enables us to gauge how much. Papers were read in the section Public Health "On the sanitary condition of the lower localities of the City of Glasgow, &c.," by Dr. MacGill, Police Surgeon, and "On the Measures required for improving the low parts of the City, &c., &c.," by Mr. James Watson (afterwards Lord Provost and Sir James Watson), the descriptive parts of which really reproduce almost the same phraseology as to the condition of the Wynds, Vennels, and Closes, as had for half a century been applied to them with monotonous reiteration. We shall quote three detached sentences from

---

[1] In 1900 an additional Hospital was opened at Ruchill on ground extending to 36¼ acres. It contains 440 beds, and cost £300,000, including furnishings. In 1903, 11 acres additional were acquired. Adjacent to the Hospital a Disinfecting and Washing-house was also erected on 1¾ acres.

Mr. Watson's paper, premising that the details with which he supports these generalities afford a redundant justification.

> "Our City is distinguished for its wealth and commercial enterprise, its public buildings, its extensive manufactories, its numerous charitable, religious, and philanthropic institutions, and is ever foremost in all great and patriotic movements; but it is not to be concealed that there are certain portions of it in a most frightful condition, and which, like so many plague spots, demand investigation and call for legislation and reform. . . . We question if in any city of Europe the vicious are allowed to congregate together in such clusters as in the City of Glasgow, and in no city that we are aware of are such facilities given, by means of the buildings and localities, both for hatching and perpetuating [perpetrating?] vice and crime. . . . It appears to us that the radical and only effectual cure for such evils is to sweep away these old buildings; to form commodious thoroughfares and to erect buildings with proper conveniences and comforts in room of the old."

We have still later testimony in the Reports of the first Medical Officer of Health. Notwithstanding the exigencies of Dr. Gairdner's position, within a few months of his appointment he found time to make "a personal visitation of most of the epidemic localities within the boundaries of the Glasgow Police Act" and to describe in detail, without rhetoric but with unreserved fidelity to fact, what he observed, which seemed to him to explain the prevalence of epidemic fever in Glasgow. The main body of these observations was published in his third Quarterly Report for 1863, before he had been a year in office. Anyone who is familiar with the literature from which we have quoted so extensively will at once recognise in this report the same old facts. It contains nothing new. The reports of the District Surgeons to Dr. Perry as to the state of their districts in relation to the epidemic of 1843 practically deal with the very same places as Dr. Gairdner's reports in 1863. The same wynds, closes, even tenements, appear, only the earlier reports refer to them more frequently by the picturesque local names than by the prosaic numbers of the later. The conditions noted and described are not essentially different. Still this does not bate a jot of the merit or historic importance of Dr. Gairdner's work, which no doubt gave the final impulse which launched that Improvement Act which was in the thoughts of Mr. Watson when he read his paper in 1860. The suggestion of such a scheme was as old as the perception of the conditions it was intended to remedy. It is one which we find in local literature from the very first time when the "Fever," like the Ancient Mariner, "held with his skinny hand" the comfortable citizens of Glasgow and told them the tale of the wynds. In 1818 Dr. Graham wrote—"I believe it would greatly add to the healthiness of the place if some *improvements which I have* *heard talked of* were effected, and straight and wide streets carried in different directions through these depositaries of wretchedness." Yet it was not until 1866, well nigh fifty years later, that the community through its representatives confessed its sin in the preamble to the City Improvement Act:—"Various portions of the City of Glasgow are so built, and the buildings so densely inhabited, as to be highly injurious to the moral and physical welfare of the inhabitants." Private philanthropy foreran this public action. When the purchases, begun under the resolution of the plague-stricken forties, were exhausted, a number of citizens, of whom Mr. Watson was one, entered into combination for the private purchase of unwholesome property, which they naturally effected on more favourable terms than any public body could obtain. They subsequently handed over all their acquisitions at original cost to the Improvement Trust. The modern form of Divine Right—the infallibility of the majority—was never more disparaged than by the manifestation of popular feeling which burst out on the imposition for the first time of that most righteous tax—the City Improvement Tax—and wreaked its vengeance on Lord Provost Blackie, who carried through the scheme. There had been no opposition in the Town Council, none in Parliament. All the opprobrium of those testimonies of half-a-century must be wiped off. The "Fever-tax" was to be displaced by the "Improvement tax." Mr. Blackie represented a ward in the centre of the city which actually embraced many of those plague spots. He wished to assist in the initiation of the gigantic and then unprecedented scheme. His re-election was challenged distinctly and expressly on the ground of the Improvement Tax, and he was defeated! So shallow at times are the thoughts of the multitude.

CHAPTER II.

THE DECADE, 1862-1871: FIRST EFFORTS OF THE NEW ADMINISTRATION.

(*a*) ADMINISTRATION. (*b*) HOSPITALS.

In the preceding chapter we have had described the embryo Administration which had been designed to cope with the sanitary requirements of the period.

Dr. (now Sir) William T. Gairdner had been appointed Medical Officer of Health, and shortly thereafter the Corporation, having embarked on a definite policy of providing hospital accommodation for the treatment of its infectious sick, Dr. Russell was appointed as Medical Superintendent of the Parliamentary Road Fever Hospital.[1]

Hitherto the argument for sanitary reform had proceeded generally by marshalling the facts so as to produce broad effects. The aim had been to produce a series of impressionist pictures, which were best suited to appeal to the public conscience.

Now discrimination was possible. Disease in the individual was to be traced to defects in the social organism, and Typhus Fever supplied the first clinical evidence of the results of domestic overcrowding.

There lay ready to hand the new and hitherto untried provision for "ticketing" the smaller sized houses, which was shortly to demonstrate its value, in Dr. Gairdner's hands, in the extinction of Typhus Fever in Binnie's Court and the Drygate "Rookery."

The provision of hospitals also opened up new aspects of municipal responsibility, and the need for associating this with provision for disinfection and washing, and for the supervision of certain classes of contacts with infectious disease, soon became apparent.

---

[1] Also known as Kennedy Street Hospital.

From the very outset the wretched conditions of the housing of a large section of the population attracted attention. Throughout the successive Reports of Dr. Gairdner this is frequently insisted upon, and in 1870 he reviewed the whole subject of house construction as a cause of Mortality before the Philosophical Society of Glasgow.

In connection with the hospital policy also new questions were arising. Their site and construction, organisation, dieting and nursing all had to be considered, and the narrative, as detailed in "Evolution," may here be interrupted in order to summarise shortly the experience of both Officers as related in their Reports issued during this decade.

Among the early difficulties was the lack of information regarding the occurrence of cases of Infectious Disease. The Infectious Disease (Notification) Act was many years in the future, and a special non-medical Inspector, detailed from the police force, was employed to trace out new fever cases.[1]

Regarded from the point of view afforded by the facilities now existing, the provisions for disinfection were of an equally elementary character. "As yet the official operations have been limited to washing and white-washing the floors and walls of the infected apartments, with thorough ventilation, and purification of their contents. I am of opinion, however, that it will be expedient in many cases, where sufficient facilities do not exist for the thorough purification of the bed and body clothing of the sick, that this duty should also be undertaken by the public; and as this will sometimes involve expenses which will fall to be defrayed by the Parochial Board,[2] it will be necessary to secure their co-operation in the proposed proceedings."[3]

Insufficient hospital accommodation for Typhus Fever led to overcrowding of wards, and the eighteenth century experience of Sir John Pringle with the Army in Flanders had been repeated in civilian hospitals at home.

"In the last really considerable epidemic of fever in Glasgow—viz., in the years 1847-48, when so many fever sheds were built within the grounds of the Royal Infirmary, a serious error was undoubtedly committed, in holding this excellent institution responsible for the indefinite or practically unlimited admission of cases of epidemic disease. The consequence was, during that great epidemic, that the supply of cases was for a long time greatly in excess of the means at the disposal of the Managers; and further, that cases were brought to the Infirmary from great distances and under circumstances which rendered their removal a source of most serious danger, not only to themselves, but to many other persons. The same evils were felt, perhaps even to a greater degree, in Edinburgh, where the Royal Infirmary was looked to as the sole resource in cases of fever over a wide area of the east country. Hence arose, both in Glasgow and Edinburgh, the most pernicious overcrowding of the wards, a very high rate of mortality of the fever, and *the almost certain seizure of all persons within the range of infection, and especially of the nurses and attendants on the sick.* These evils, there is every reason to believe, may be avoided; but they can only be avoided by due foresight, by keeping the accommodation constantly in advance of the demand, and by placing it within reasonable limits of distance from the infected localities."[1]

---

[1] Dr. Gairdner's First Report, April, 1863.

[2] Dr. Gairdner's First Report, April, 1863.

[3] First Municipal Disinfection and Washing-house provided, 1864.

The policy of tracing new cases of Typhus Fever, however regularly pursued, proved quite inadequate to stem the rising tide of Typhus Fever while overcrowding remained unchecked, and in July, 1863, an application of the ticketing Clauses (385-388) of the Police Act of 1862 was proposed to tenements in Binnie's Court, in Argyle Street, and 83 Drygate.

"It is no uncommon thing for fever cases to run a course of a week, or even a fortnight, before they are discovered in the houses of the poor; nay, it is to be feared that some are never discovered at all, and that medical assistance is only sought when two or three of a family have taken ill, and when, in all probability, contagion has been at work for weeks in the infected locality. From inquiries I am quite satisfied that many fever cases, even in the worst possible sanitary circumstances, in the most overcrowded houses, in the midst of neglect, filth, and wretchedness, are not, and some of these cannot be, removed to the Infirmary. I am equally well satisfied that so long as this is so, and so long as healthy persons are unwittingly or unavoidably exposed to the contagion of fever in overcrowded and ill-ventilated apartments, sanitary visitation can only be an imperfect check upon the spread of this disease. The strong convictions I entertain on this subject and the very decided support afforded to those convictions by the facts of the present epidemic, have induced me to recommend a more stringent application than heretofore of the new powers conferred by the Glasgow Police Act in two of the most notorious fever localities; and I shall be guided by the effect of these recommendations in making further efforts in the same direction. It is of importance that in the application of these stringent clauses there should be nothing ill-considered, nothing arbitrary or indefensible. I am, therefore, well content that these two cases should be fully and clearly before the public as a basis for future action; and I hope that, by securing in advance the influence of free discussion and the support of public opinion to the measures proposed, they will be rendered both more safe and more efficient for the purpose in view—the gradual reformation, and in some cases reconstruction, of the houses of the poorer classes, in accordance with those conditions which can alone deprive epidemic disease of its most dangerous peculiarities."[1]

---

[1] Dr. Gairdner's First Report, April, 1863.

In concluding the special report on the Application of the Clauses referred to, Dr. Gairdner observes :—

"For the first time in the history of the City, the authorities have acquired power to signify to the proprietors the limits within which the population of small dwelling-houses of one, two, and three apartments must be restricted; and also, in certain extreme cases, to insist upon structural alterations in accordance with the Act. The Clauses of the Act here referred to have been framed after very careful consideration, and it is impossible to doubt that their judicious and considerate application, from time to time, to buildings, the state of which is demonstrably injurious to the public health, no less than to safety of the individual inmates, will be productive of great good. There is no social law more certain in its operation than that by which neglected or mismanaged property becomes dangerous, both physically and morally, to the community. The absence of the means of health and comfort has a tendency, in the first instance, to repel the industrious and respectable artizan; and sooner or later the temptation becomes irresistible to admit greater and greater numbers of a class having lower pecuniary means and less scrupulous habits of living; the gradual degeneration of the property and its occupants being equally injurious to landlord and tenant."

The machinery against overcrowding having been set in motion, and the provision of hospital accommodation being in contemplation, a further step is suggested in the Report for October, 1863. This was the provision of Reception Houses ("Houses of Refuge," Dr. Gairdner calls them) for the accommodation of the families of those who were seized with fever in excessively overcrowded apartments "during the period that might be necessary to secure them against infection in cases where it was found impossible to do so by removing the sick and purifying the infected house."

The need also for making provision for washing and disinfecting the clothing and bedding of the sick by the local authority is again insisted on.

This Report contains many vivid pictures of the Epidemic Areas of the period. The language of Sanitary Science to-day suffers in no small degree by reason of the inflexibility of its terms. A house is uninhabitable because it is damp, or defective in light and ventilation; it is structurally neglected so that defects in the plaster expose underlying bricks or laths. The terms are the same, but the conditions described vary. Let anyone familiar with the structure which may be described in the foregoing terms compare it with what is implied in the following sentences. "*In one court (in the Eastern District) a square block of building intended for a middenstead, has been roofed over and made into a dwelling-house. In another a room built for a wash-house has since been similarly occupied.*"

---

[1] Second Report of the Medical Officer, July, 1863.

As we have said, throughout the Reports of the period the wretched character of the moderately and low rented house accommodation for the poorer classes of the population is frequently referred to in connection with the prevalence of disease among their occupants, and in 1870, Dr. Gairdner discussed the "Defects in House Construction in Glasgow as a Cause of Mortality" in the knowledge that public opinion was not yet sufficiently formulated on the question to support the radical changes necessary.

The question was not a new one to a Glasgow audience, indeed, in one form or another, it had entered largely into the discussions which, in former years, had preceded unification of legalised poor relief in Scotland. It finds notable expression in the writings of Rev. Dr. Thomas Chalmers, at the time when he was minister of St. John's Parish in Glasgow, and a most strenuous opponent to what he called "interference by the legislature into the sphere of benevolent relief." Chalmers' advocacy of the sufficiency of the parochial system without a poor rate is well known, and the success of his scheme in St. John's Parish amply demonstrated the strength of his contention. But his views on the need for sanitary reform have somewhat been lost sight of. To those familiar with his work, it need not be recalled that his political economy was founded on the New Testament narrative; and that he found therein a distinct cleavage between the method obtaining for relieving want and that for treating disease. "Nor is it difficult," he says, "to apprehend the principle of this distinction. A known provision for want, if it be want irrespective of character, is sure to create and multiply its own objects in every neighbourhood where it happens to be established—seeing that all who choose might make their way to it, by the accessible and inviting path of a little more indolence or a little more dissipation. It is not so with an asylum of disease, for which men will not qualify voluntarily. . . ." "What we have now stated is but introductory to the further statement of the fears we at one time had for Scotland, and which are not yet wholly set at rest. A Bill was lately in progress through Parliament having for its single design the promotion of the public health, and especially among the lower classes of society—those, in particular, who are congregated together in the deep and dark and densely-peopled recesses of our larger towns. We trust that it will fully comprehend, at whatever expense, all the provisions which might contribute to the success of so beneficent a measure—as *drainage, and ventilation, and the minimum size of houses, and the proper width of streets and alleys; and withal the establishment of a medical police for the removal of nuisances, and even a cheap if not rather a gratuitous supply of professional services for the general population.*"[1]

Dr. Gairdner's paper is published in the Proceedings of the Philosophical Society, Vol. III. (1870-71), from which we take the following extracts :—

I beg to proceed to make some remarks upon defects of house construction, as they occur in Glasgow. We are all aware there has been a great deal of public attention bestowed upon this subject of late; and therefore it has occurred to me that, with the number of practical and at the same time scientific men who form this Society, it might be useful to put before you a statement or an argument tending to bring the question of house accommodation back, as it were, to its first principles—to shew what is, and what is not, the central idea of a house, and how that central idea of a house has been in times past, and possibly is even now, violated in this great city of ours. I am quite aware that the faults that exist are faults which have been in great part transmitted down to us from our ancestors, and that the cure of them will be a matter of time, and will require a great amount of public energy and public thought. I think that hitherto there has not been, perhaps, a sufficiently widely drawn attention either to the extent of the evil or to the measures that are regarded as remedial measures. And speaking as the organ, as one may say, of medical opinion, in so far as it has been called to it officially; I may say our difficulty has been all along the fear that our own position is not sufficiently secure—the fear and the certainty, indeed, that we could not propose, with any chance of carrying public opinion with us, measures of the extremely strong and radical order that are absolutely necessary to cope with the immense evils we have to deal with. Till we have public opinion with us—and this is not only having the arm of the law, as represented by the authorities, with us, but the large concurring force of public opinion—till then, I believe we shall be too weak to cope successfully with the evil; but I am not without hopes, from the great attention bestowed on the subject by newspaper editors and commissioners, by deputations from the Corporation to English towns, and from the various ways in which the attention of the public has been called to it—in a manner it never has been before—that the principles that lie at the bottom of the whole matter will now obtain a degree of consideration they have never hitherto had. Now, it is difficult to know where to begin,—the evils in our great towns are so many, the bearings of those evils are so intricate, the interweaving of the physical with the moral is so extremely complex. But perhaps we may begin at the fact of overcrowding—a primary fact, one recognised in every investigation into the state of great towns, from the time of the first inquiry by Lord Shaftesbury, then Lord Ashley, and Mr. Chadwick, about 1832 and 1834, down to the present time. We may take it as admitted that overcrowding is perhaps the greatest cause of disease in our great towns, and that it is also very intimately connected, in some way or other, with the social degradation and misery of a very large portion of our working classes.

---

[1] See Section on "The Medical View of the Question" in the works of Thomas Chalmers, D.D., LL.D., Prof. of Theology in the University of Edinburgh, and corresponding Member of the Royal Institute of France.

It may seem paradoxical, but, nevertheless, I believe it is perfectly true, to say that overcrowding is both the cause and effect of a large number of those evils. It is, in the first instance, the cause, because populations come from remote parts of the country, with perhaps very imperfect ideas of domestic comfort, and with a tendency, therefore, to overcrowding, and are subject to inducements to overcrowding which are greater than those existing in the country. But the evil does not stop with the first generation, because the second generation is brought up under a set of mental and moral impressions, and under a set of physical insensibilities, so to speak, which tend to make overcrowding a worse evil in the second generation than in the first. Whatever the original cause of these and other bad habits, you may take it for granted that they tend to impress themselves indelibly after a time, on the whole nature, moral and physical, of entire generations of men. It may be said, without the slightest exaggeration, that there are scores of thousand of persons in this great city who have been so brought up that they literally do not know, and literally cannot feel, the value of house-room—of more space in the house in which they dwell; and they cannot even rise to the idea of the most limited kind of domestic comfort. Nay more; it is the case that they literally prefer discomfort—absolutely prefer overcrowding; they regard it in the light of a positive inconvenience to have more than one room for the family, because, they say, "What is the use of other two or three rooms? you would simply have your neighbours coming and sorning upon you." It would simply be an inducement to the less well-housed to come in and eat up their family resources. Now, many evils result from this state of things; but I shall only mention four of the consequences of living in that condition of overcrowding and domestic discomfort. The first consequence is enormous liability to epidemic disease; and not only to epidemic disease, but to consumptive disease, and various diseases of the lungs; and, further, a literally enormous rate of mortality in young children in particular, partly, of course, from epidemic disease, but partly also from a great number of other diseases, especially nervous diseases, convulsions, hydrocephalus, tubercular diseases of the abdomen, and various other kinds of disease which we know to be destructive of infantile life. The second consequence is, that, from living in this state of habitual overcrowding, the sense of decency is injured inevitably, and ultimately it is lost altogether. The third consequence is, that almost inevitably a craving for alcoholic stimulants is generated; in many cases due not merely to bad habits, not merely to bad examples, and not merely to the neighbourhood of spirit shops, but due to the want of what we may call natural stimulants, which go with us all to make up the idea of domestic comforts. Of course, I do not mean that there may not be persons who, by dint of superior virtue, are able to preserve themselves almost under any circumstances from these evils. It is the internal discomfort, it is the dreadful want of fresh air and of anything to relieve the monotony and dulness of life at home, that drives many to the public-house. Instead of regarding the public-house as the creator of the evil in the full sense, as some of our more extreme teetotalers do, I think the public-house arises where the demand exists, and where there are none of those natural stimulants which help to make home a desirable residence. The fourth consequence of this state of overcrowding, in badly-constructed houses, is a great degree of moral degradation and of religious apathy. How should it be otherwise? How is it possible for the most elementary ideas of morals to be kept up, where husband and wife, and ever so many children of different sexes, or where husband and wife, one or two young women, and a male lodger sleep in the same apartment? How is it possible that the ministrations of the minister of religion can be in any way effective in these circumstances? How is it possible that the highest and the most refined transcendental idea, as it were, of human nature should gain access to homes of the kind that I have described? The thing is simply impossible.

We therefore put down moral degradation and religious apathy as among the ultimate consequences of this evil. Now, I anticipate at this point a certain objection to the views I am going to present. It will be said, "You have spoken of this as an evil of great towns; but has it not been proved over and over again, in the reports of the Sanitary Commissioners, that overcrowding is just as great and as rife in the most remote country districts as it is in the great towns? Is it not proved that the inhabitants of an Irish cabin in Galway, and of a Highland shieling in Lewis, are just as overcrowded, just as physically dirty, and their inhabitants physically living upon as low a scale of comfort as the lower classes in great towns like Glasgow?" But, on the other hand, it may be said "that overcrowding is always and everywhere an evil." It is not in the same sense or degree an evil in the isolated hut or row of cottages as it is in the tenement of houses in a great city; for in the great city there are several conditions that do not exist in the isolated hut or shieling, let them be ever so overcrowded—let the physical outside of them be ever so poor, and the interior ever so squalid. In the *first* place, in the town there is the overcrowding of the ground as well as of the room. There is not merely the overcrowding of human beings in the room or house, but there is the overcrowding to an enormous extent of the number of rooms and houses upon a given space of ground. The consequence of this is, that there is literally no possibility of wholesome occupation, exercise, and amusement out-of-doors on the neighbourhood of the homes. As to the most squalid Highland hut, there is the hillside to go to; there is the neighbouring burn to carry away impurities; there is the grass meadow, the riverside, the trout to catch in the burn for the children, and every sort of outdoor recreation in the midst of fresh air. In the town there is nothing of the kind. The evil of overcrowding in the town, as regards facilities for recreation out-of-doors, is therefore enormously greater than it is in the country. *Secondly*, there is not merely overcrowding of the ground space with houses and with tenements, but there is overcrowding of the tenements with rooms, and of the rooms with persons. As there can be no true occupation, amusement, and healthful recreation out-of-doors, so there can be no time, day or night, when the family is safe from invasion, and when the instincts of home can possibly be cultivated, in the middle of those great collections of human beings, in tenements crowded upon a small space of ground. In both these particulars our cities, and especially our Scotch cities—perhaps Glasgow above all other cities—have erred in permitting such constructions as make it simply impossible to preserve the domestic habits; and this has been going on increasing in amount, from year to year, for at least several generations. It is true that the habits of the immigrants into our great towns are often aboriginally bad, especially where, as in the case of Glasgow, many of them come from Highland shielings and from Irish cabins. But then the effect of these bad habits is intensified, and in most cases bad habits are meanwhile created by the transference of these rural aborigines to the town habitations. Hence, from generation to generation, a progressive deterioration, and finally an almost total loss, of the instincts of the family.

Now, it is at this point that I approach, as it were, the theme of the present discourse. What I want to prove to you is, that, to a great extent, it is the house that makes, and the house that mars, the individual and social man, not to say for a moment that individual character has not a great deal to do in the matter,—not to say that the pure-minded, noble-minded man, with heroism in the blood and bone of him, with physical instincts of the most exalted kind, will not preserve himself pure from contamination in the midst of all these evils. But, speaking of the average of man, I hold that such as is the house, such will be the men. If you persistently keep up dwelling-houses that are inconsistent on a large scale with domestic comfort, you not only allow to grow up in these houses, but to squat in them, generations of men whose ideas of domestic comfort will go on deteriorating every year. Consider how much is implied in what I have called "the domestic instincts." How many of the noblest virtues are embraced in that category? Is home not for every one of us the real school of all the virtues? Is it not true that home, and everything that grows round the home, is the real God-appointed school for virtue, religion, everything that raises humanity above the beasts? Well, then, you cannot consider a house as a mere mass of stone and lime. You cannot consider it as just four walls. You must consider it in the light of a home to bring up a family in. If you establish in your cities dens (I have called them over and over again "fever dens," but let us say, in the meantime. dens) that are not fit for the dwellings of men, you may depend upon it that the inhabitants will grow up with the habits of wild beasts. I assert, without fear of contradiction from anybody who knows the state of the case, that in most parts of Glasgow, and of other great cities in Scotland, a healthy and well-trained family is not even a possible thing, from the overcrowding of the ground on the one hand, and of the houses and tenements on the other. These evils are constantly aggravated by the pressure of the rural population towards and into the great towns, whereby larger and larger proportions of the population of the whole country are exposed to the deteriorating influences of homes in which it will be literally impossible to preserve even the traditions of healthy family life. Hence the rising death-rate, the increase of epidemic sickness, and deteriorating morals with respect specially to drunkenness, and of sexual immorality among the lowest classes in our great towns, at the very time—observe, I speak of the last fifty years—when the upper and middle classes have everywhere improved in their habits, and are less subject to the causes of mortality than they were half a century ago.

Here, then, is the problem you have to solve. When our middle and upper classes are rising in the scale, our lower classes are going down, and down, and down, and a larger number every year is pressing into our towns, to become part of the enormous mass of degraded humanity. Now, studying this subject from the simple point of view of sanitary reform, and dismissing for the time moral and religious considerations altogether—although I hold that the two cannot be separated—let us try to discover what is the minimum of house accommodation consistent with health, and, if you will, moral health; but moral health, not in respect to sin and crime, but merely in respect of the cultivation of the common instincts of humanity. I have discovered this minimum by asking what is the minimum of requirements which can be reconciled with the healthy development of the individual family. I take the family as the unit of society. If you can render your houses such as will conduce to the healthy development of one family, you may depend upon it that society at large will not deteriorate; but if, on the other hand, you cannot do that, society must inevitably deteriorate. It is not too much to affirm that the following eight points are essentials in a house. The first is *adequate cubic space* in the apartment; by that, meaning, of course, the sleeping apartment. This was intended to be secured under the Glasgow Police Act; but every one knows it has been very imperfectly secured by the legal minimum of 300 cubic feet for every adult and every person above eight years in the family, and 150 cubic feet for every person below eight years. The minimum allowance of cubic feet is far too small for a healthy existence; but it was so put into the Police Act—and I do not say unwisely—under the impression that any higher requisition than this would simply be more likely to be disregarded. Even this limited allowance, however, is not properly enforced, partly owing to legal difficulties and partly to the tenderness of individual magistrates, who have felt, not unnaturally, when poor wretches were brought up to be fined for living in overcrowded houses, and pleaded in extenuation that they could not afford to get more house-room, reluctant to inflict a fine under such circumstances; yet the fining of the occupier has hitherto been considered the only way to meet the evil.

Now, I think this is beginning at the wrong end. The conviction has been growing in my mind from year to year, that *the only way to prevent overcrowding is to throw the legal responsibility for it on the owners*, and not on the occupier. It is the factor visting the property from week to week, uplifting the rents, who can, if he pleases, prevent overcrowding. He knows perfectly well the class of people that crowd into these houses, and he can, with comparatively little hardship, make them feel it to be an essential requisite that they shall not continue the practice of overcrowding. I believe that the powers of the law would throw this responsibility upon the owners and factors; but our Procurator-Fiscal doubts it. If, then, the powers of the law won't do it, let us get new powers, and devolve the responsibility upon the owners.

The second essential is the *means of separation and privacy for the sexes within the houses*. The first question that arises is, Whether separation and privacy for the sexes are possible under the condition of single apartment occupancies? That is a momentous question in Glasgow. I am not in a position to state positively—the next census will perhaps inform us—what is the number of single apartment occupancies in the city; but, from all I know, or have been able to discover, from my assistants and others, I believe that it is not much less than 35,000. At all events, it is between 30,000 and 35,000; or, in other words, you may say that probably something like a third of the whole inhabitants of Glasgow are living at the rate of one family to a room, and in some instances lodgers are taken in besides. Now, taken in this large way, I suppose no person here will have the slightest difficulty in answering the question, Whether separation and privacy are compatible with a single occupancy? Certainly not on a large scale; and yet, I think, it would probably prove an unwise measure to proscribe single apartment occupancies altogether, because you must recollect that families are not always large. A young man and his wife begin housekeeping without children. They go on for a year or two, and, while the children are young, there may be no violation of propriety or domestic comfort in occupying a single apartment, which they do with much greater economy and, if of prudent and saving habits, with a much greater power of saving up money for the future.

Then there is the case—and it requires peculiar tenderness—of widows and of old couples without children, or whose children have passed away or gone out into life. These are cases for single apartment occupancies; and therefore I should be very sorry indeed to see an iron rule applied proscribing single apartment occupancies altogether. While, however, single apartments may be allowed to a certain limited extent, it is perfectly clear that tenements wholly or chiefly composed of single apartments are quite inadmissible in a well-regulated town, and ought to be put down without the slightest remorse. Yet in Glasgow, the manufacture of single apartment occupancies, out of buildings originally constructed for houses of two or three apartments, has been going on for many years, unchecked by any process of law; while vast numbers of tenements, originally built otherwise, have been deliberately degraded, with a view to profit, into warrens of single apartments. In very few instances has a contrary process taken place—viz., the destruction or removal of such, to replace them by more healthily-constructed houses.

The third essential is *a proper means of access*. To judge by the tenements at present existing, one would say that proper means of access have literally been considered of no account at all by our Glasgow builders. The whole traditions of house architecture in Glasgow, the whole ideas of Glasgow builders, seem to me to have been based on the principle that the mode of access to rooms was not of the slightest consequence, provided people were able to smuggle themselves into them—in fact, that the cheapest mode, the cosiest mode, the darkest mode, and the dirtiest mode, was absolutely to be preferred. The usual plan of the Scotch common stair, even in the houses of the middle classes, has been all along essentially bad—a receptacle for foul air, usually closed in at the top, and receiving the effluvia from all the houses on the stair, the lobbies of the individual houses being internal, and almost always unlit, except from the rooms, and therefore close, dark, and stifling, and the water-closets usually ventilating into, and being lighted from, the common stair. This is the plan of thousands of houses in Glasgow reputed fairly decent and wholesome, but which are simply a collection of sanitary abominations, and ought to be restrained and disallowed by law in newly-built houses. But when the same principle of internal lobbies or corridors, abutting upon or opening to many rooms, without separate ventilation and lighting, is carried into the tenement houses of the poor, and especially into houses of single apartments, all the evils above indicated, with the exception of the water-closets, of which there are rarely any in such houses, are immensely exaggerated in effect, and the facilities for the communication of infectious disease are correspondingly increased. Yet such is the construction of tenement houses. Until within the last two or three years, no builder ever thought of constructing a tenement house in Glasgow upon any other plan. The sanitary evils have been increased to the very utmost in many cases by the accumulation of numbers of ill-ventilated and overcrowded single apartments, with corridors wholly devoid of separate lighting and ventilation, and with internal closed common stairs, so that the whole tenement is pervaded by an atmosphere common to all the houses, and literally loaded with the germs of disease. This is the leading and all but universal error of house building in all the Scotch towns; and until it is thoroughly and systematically corrected, there cannot be a moderately healthy population. I may remark that, about seven years ago, in a course of lectures I delivered in Edinburgh upon public health, and which were afterwards collected into a volume, now out of print, I commented upon the fact, that while in certain marked instances the English towns were lowering in their death-rate the Scotch towns were almost universally increasing in their death-rate, and connected that fact in my own mind with this feature of Scotch house construction, which does not prevail in England at all, where almost invariably a tenement is technically called the house of an individual man, and there is some individual person responsible for it; whereas in Scotland no one is responsible but the factor. The question has been raised by a zealous and energetic gentleman, whether some good might not be done by causing, or enforcing by law, that in each of those great tenement houses there should be some resident tenant who should act as a kind of *concierge* or porter and preserver of the peace and cleanliness of the whole. The Scotch system of building you may consider as a draft from the Continent. It was owing, I believe, to our greater intercourse with France that this system came in, as opposed to the English one; but then you observe, in the Continental system, the building always has its *concierge*, who is responsible for the keeping of the whole; whereas our Scotch common stair is just simply a mass of chaos and confusion, with no one to keep order.

The fourth essential of a house, in my opinion—keeping in view a family as the occupants of the house—is proper *lighting and ventilation of rooms, as well as of lobbies.* The mere structure of Scotch houses leads to the neglect of that: and neglect caused by mere structure has not been removed by ordinary means of ventilation; but in newly-constructed houses I believe it is quite possible, as has been done in London, to introduce a shaft between the walls of the building and the chimneys, giving rise to a ventilating current that would draw off from the rooms; and even in old houses in the city I have seen considerable improvements effected, consequent on a simple expedient—one introduced by Mr. Hoey, father of the secretary of the section of Sanitary and Economical Science; and I have no doubt that even our old houses could be improved by careful and diligent consideration applied to this matter. But, besides, the windows have often been too small, or have not been made to open, or have been built up by walls interfering with the circulation of air. Box-beds or dark closets have been used as sleeping apartments, and underground dwellings still exist which ought to be shut up.

A fifth essential is *adequate privy accommodation*. I regard this as a first necessity of healthy domestic life in a town. No habitation can be considered admissible in towns where accommodation of this kind is not provided, so as to be easily accessible to women and children, as well as to men; and so far brought into connection with individual tenancies as to secure real privacy, as well as the responsibility of individual householders for cleanliness and the prevention of nuisance. It is scarcely necessary to point out that, in this particular, our Glasgow houses, even of the respectable working classes, have often been systematically deficient; and in the tenement houses of the lower working classes, it seems as if the very idea of privy accommodation had been deliberately abandoned. We know, in fact, that in a past generation the midden heap in the open court was often the only form of deposit for filth, contemplated by the builders of houses intended to lodge hundreds of human beings, and in very many instances the ground has been so occupied, and the structure of the houses has been so complicated, that neither without nor within the house has it been found possible to supply the deficiency. The system of public privies is no doubt an advance on this absolute want; and you have only to look to the reports of Dr. Neil Arnot and Albert Smith to see that the absolute want of privies was the rule thirty or forty years ago. But the system of public privies does not properly supply the want; indeed, a public privy is a contradiction in terms, and is quite inconsistent with a due regard to the cultivation of the domestic habits. I do not here enter on the disputed question, how far water-carriage, on the one hand, or other systems of removal, on the other, are the preferable modes of disposing of excrementary filth; the one point needful to be maintained at present is, that the privy should be really what its name implies, and not, as it is throughout the poorer quarters of our Scotch towns, a common resort of the men in all the families of a populous tenement, while women and children almost invariably refuse to go to it. But how this improvement is ever to be accomplished, except by a complete change in the views of builders, or of the authorities controlling builders, as to what are the domestic essentials of such tenements, I confess I cannot see. In houses constructed for the poor, we are in this dilemma : to admit the water closet, or any form of privy, into the interior of the house, is simply to court the diffusion of unwholesome gases ; while to rule in favour of accommodation outside of the house, is to sacrifice the whole idea of decent retirement and make the privy a place for the deposit of miscellaneous filth of a whole village of persons, many of whom are already lost to all self-respect, and perfectly careless both of their own comfort and of that of others.

The sixth essential of a house is *an adequate water supply.* Upon this subject I shall say little, because, by the aid of the Water Commissioners, Glasgow has now been supplied with water almost as effectually as the existing nature of the houses admits. But here, too, the construction of these tenement houses has stood in the way of the supply of water. In the house represented by one of the diagrams before you there was no water supply until quite lately ; and although it is a house of sixty or seventy families, there is no water except in the close. The reason was, that the whole interior of the lobbies was so utterly dark that to put a water supply in any lobby or landing would simply be to keep the place in a perpetual state of slop and puddle ; while, on the other hand, to put water in the rooms, would bring in the objectionable principle of having water-sinks, and therefore the possibility of regurgitation of gases in single apartments and bed-rooms. Hence we were obliged to decide that no water supply should go into that house of six storeys high until it was remodelled.

The seventh essential of a house *is baths and wash-houses.* Upon this point I shall also say very little, because the propriety of the thing is almost universally recognised, and it is only owing to adventitious circumstances that efforts have not been made by authority to supply the want hitherto. But it will require careful consideration even now, not only on what principle a public bath is to be managed, but also on what principle you are to supply wash-houses to the inhabitants of these enormous tenement houses. As a rule, these people do not like to go to public wash-houses at a distance. They much prefer to wash in their own apartments ; and if you want to seduce them out of that habit, and thus give them facility for washing upon a larger scale, you must have wash-houses placed in such proximity to the rooms, that one wash-house is only used by a limited number of persons. That is nearly impossible in the old tenement houses of Glasgow. Here again, therefore, we find the same difficulty, the construction of the houses having been such as not only not to supply the first wants of domestic life, but to make it impossible, by any subsequent attention to details, to supply those wanting elements in anything like a reasonable and useful form.

The eighth and last particular I shall touch upon as an essential to a house is *airing and recreation ground.* Now, perhaps even some persons here will be inclined to say, " Oh ! this is quite an extravagant view of the subject. Have we not good broad streets? Airing and recreation grounds are not always attached to the houses of the better classes,—why have them for the poor? This is an altogether Utopian idea !" Well, I say, from the very fact of placing this among the essentials of a house, it will appear that a verdict of condemnation is passed upon the entire system of multiple occupancies within vast tenements, such as exist in Glasgow and most of the other large towns in Scotland. Yet the verdict is not too severe, where it can be proved that over considerable areas 600 to nearly 1,000 persons—men, women, and children—live together, in what are supposed to be families, upon a statute acre of surface. What kind of family life, it may be asked, is even possible under such circumstances, where the children have literally no place to meet each other, except in these dark lobbies of the houses? or, if they go out of them, no place whatever except in the middle of the street, and this in parts of the town where thousands and tens of thousands of families are brought together, and where there is literally no street that is not a crowded thoroughfare ; where the houses have no back yards, and where, excepting the street and the close, and the nasty, stinking, dirty lobbies, there is literally no place for children to play, or in which old people can take a little exercise.

HOSPITALS: THEIR ORGANISATION, ETC.

In the direction of hospital provision also the Local Authority were obtaining new aspects of the extent of their responsibility. During the years '65-'72 Dr. Russell, as Physician Superintendent of the Parliamentary Road Fever Hospital, issued five reports. It was characteristic of his work that no opportunity should be lost of marshalling the facts of observation so that general principles of wide application should be disclosed rather, as it were, by a process of evolution than as a distinct act of logical inference. It must be remembered that at this time the economics of hospital service were but in their infancy, and municipal acquaintanceship therewith entirely unknown ; nor were principles of construction better understood, while the popular conception of nurses and their qualifications had been, in quite recent years, crystallised in the pages of Mr. Charles Dickens. It was natural, therefore, that the reports issued from Kennedy Street should deal with such questions as hospital construction, organisation, dieting, and nursing as questions of the first moment, and rarely has their importance been better urged.[1] The introduction to the first report indicates the earnestness with which the work was undertaken and the level of efficiency in administration aimed at.

"In thinking over the plan of the following Report, I had not gone far before it became apparent that I could not take for a model the ordinary form of such documents. Hospital Reports in general merely narrate what has been accomplished by an institution which has been long in existence, the internal economy of which is thoroughly known and well established, where the management is, so to speak, public, and the responsibility for its good conduct distributed over many. The subject of the present report is not such an institution. It was erected to meet an emergency—entrusted, without constitution, or staff, or rules of conduct, to the care of one person—and opened with no certain prospect of duration. Excepting to a few, the principles adopted in the working of the Hospital, and the various incidents of its management, are unknown. I feel, therefore, that I occupy the position of one who ought to narrate, with all the aid of diaries, copies of correspondence and despatches, the results of a distant administration rather than that of one who has been working under the immediate observation of those to whom he is responsible."[2]

ESSENTIALS OF SUCCESS IN HOSPITAL MANAGEMENT.

The importance of an efficient and reliable nursing staff is now so well recognised that one must read the description of the difficulties then existing in order to appreciate their magnitude.

In the earlier Report these are dealt with at considerable length, and are even now of interest, because they formed the basis of "A plea for the establishment of a Nurses Home and Training School in Glasgow," which inaugurated a new era in hospital and private nursing.

The successful management of a hospital depends almost entirely on the careful pre-arrangement of two departments—*the Kitchen* and *the Nursing*. Financially, the larger proportion of the working expenses falls under these heads. Medically, no advantages of situation, of professional skill, or sanitary arrangements will make up for defective nursing; and it is absolutely necessary that the dietary be carefully considered and planned, so as to aid medical treatment and at the same time be economical.

---

[1] The Reports also contain much valuable clinical material, some of which is included in the Chapter on "Clinical Studies."

[2] From Introduction to First Hospital Report, 1865-6.

All this is most especially true of a fever hospital. With regard to the *Dietary*, there is now no doubt that in the judicious administration of suitable food lies the secret of the successful treatment of fever. While actually in the heat of the disease, the principle to be remembered in the choice of diet is, *the maximum of nutritive power, combined with digestibility proportioned to the enfeebled stomach of a fever patient.* It is, therefore, a grave mistake to supply articles of inferior quality. The whole strength of the dietetic resources of the hospital ought to be spent upon the first ten days of a patient's residence. Life or death is the question decided in that time.

"The second of the two departments, on the careful pre-arrangement of which the successful management of a hospital chiefly depends, is the *Nursing*. I shall take this opportunity of proffering a few remarks on the general question of the education of nurses. This I am the more anxious to do because the subject is one which, with all deference be it said, does not receive that attention it merits either from the general public of Glasgow or from the managers of its public institutions.

Two circumstances render the maintenance of an efficient staff of nurses in this Hospital unusually difficult. It is a *Fever* Hospital, and the number of respectable women, willing to become nurses, who have had fever, is small; and of those who have not, few will encounter the danger, which, as our own experience has proved, is not exaggerated. It is also a *temporary*[1] Fever Hospital. All risks being run, no prospect of permanent employment could be held out to any one: so that, with such a prospect, an engagement at a half less wages was preferable. Still, making every allowance for the difficulties peculiar to my present position, my experience elsewhere, and all I can learn of the experience of others, is of such a nature as to convince me of the urgent need for pressing upon public attention the importance of a supply of good nurses and the present want of it. As things are, nurses have no organization as a class, and no *morale*. The popular idea, particularly of a hospital nurse, resembles that of a washerwoman—drinking is inseparable from both. The idea is only too true, in fact; and its very existence and truth react against any individual effort to raise the standard of character. Indeed, I often fancy good people are amused while listening to my complaints, and surprised that I have not yet learned to believe that drink and dishonesty are essential properties of a nurse. I admit that at present nursing is the last resource of female adversity. Slatternly widows, runaway wives, servants out of place, women bankrupt of fame and fortune, from whatever cause, fall back upon hospital nursing. When on a rare occasion a respectable young woman takes to it from choice, her friends most likely repudiate her, her relatives resort to various ways of concealing her whereabouts. . . . For all this we have ourselves to blame. Until our nurses have conferred upon them the dignity and *morale* of which a special education, special organization, firm and kind moral supervision, with high pay during active service, a home when not actually engaged, and a superannuation fund to look forward to in old age, we never shall have good nurses—or if we have them, we don't deserve them. Fortunately we do find good nurses, as good as any system could produce; but they attract the eye here and there by their stability amid a succession of waifs and strays, which float in and out of the institution as each month comes and goes. Instead of having a stock of nurses in different stages of their education upon which to draw when necessary, the present state of things is this:—Our large parochial hospitals are entirely left to the care of pauper nurses, the best that can be chosen of a bad lot—and well some of them do their cheerless, thankless task; but having, as a rule, no good to say of them, I prefer to be silent. Where paid nurses are employed, after passing in review a host of women of the sort I have truthfully described, a 'likely' person is selected. With no better testimonial of fitness than that of being 'likely,' she is put at once into a ward as day or night nurse. She certainly has received no previous instruction in the art; she may never have given a cup of cold water to a sick person—never made a poultice or administered an enema, or seen a person die—as once happened in my own experience, when a nurse, from sheer ignorance, told me a patient had 'fallen quiet,' who was actually dying! She may be the best material in the world to *make* a nurse out of; but if she providentially becomes one, it is more a freak of nature than the result of design—like Topsy, she must have 'growed.' I have never seen any systematic effort made to instruct a nurse. The visiting physician makes remarks to the student—the house-surgeon teaches the dresser bandaging and the putting up of fractures; but there is no such thing as educating the nurse. Yet I have seen, for example, a case of secondary haemorrhage in a surgical ward, where, had the nurse been taught to put her thumbs over a certain spot, and press firmly, the bleeding would have stopped; but she never had been taught—she ran for aid—and in a few minutes the patient was dead! I believe that many fever cases would be benefited by the constant presence of a doctor, to give and withhold stimulants from hour to hour according to the pulse and general symptoms. If so, how important must be the intelligence and well-informed judgment of the nurse who alone is always beside the patient. Nor is it the patients merely who profit by the services of a faithful nurse. The amount of waste which one who is dishonest or undutiful may cause or encourage, and therefore the economy which one who is faithful may promote, is incalculable —to say nothing of the economy of life, which is the real end to be served by hospitals, and which, as a rule, is more controlled by the nurse than the doctor; that is to say, a fever patient with a bad nurse and a good doctor has a worse chance than one with an indifferent doctor and a good nurse."

---

[1] By the Police Act of 1866 the Municipality bound themselves to provide and maintain Hospital accommodation for Infectious Diseases.

REQUIREMENTS OF PRIVATE NURSING.

"I cannot pass from the advocacy of the cause of Hospital Nurses without remarking that efficient private nurses can never be educated save in Hospitals, and that, therefore, until a better system is adopted for the nursing of hospitals, private nurses will exhibit the same defects. If the public were open to no other argument than self-interest, which I do not believe, then no better case could be made out than that for the systematic training of Hospital Nurses. In the endeavour to supply ourselves, we have obtained many painful glimpses of how the public are supplied. I have in my mind the case of a woman who had the best of private nursing, who was engaged here simply on this ground, and was sent by us to Bridewell for theft; and more than all, as we now know, before she obtained this position as a private nurse, she had been in prison on a similar charge; and more still, she has already got employment as a nurse in another city. The scarcity of trustworthy nurses, especially for infectious diseases, is shown by the frequent applications made to the Matron for aid in their search by persons sent by the leading practitioners of the city. All this arises from the want of organisation. Living here and there in bad localities, exposed to temptation, and struggling with poverty, private nurses are as much to be pitied as blamed. They ought to have a headquarters when disengaged, where they might report themselves and be reported on by their employers, and whence they might be taken with a certainty that their history and character are known, and they themselves are trustworthy.

It may encourage those who feel interested in this matter to say that I feel convinced that, even for a fever hospital, a class of women superior to any hitherto employed as nurses may be found by holding out adequate inducements. In the case of general hospitals the task would, *a fortiori*, be much easier. We were early forced to the conclusion that two classes of applicants were not to be received at all—those who had been in a poorhouse, and those who had been in other hospitals. We found it best to engage women of good character who knew nothing about nursing, and to educate them. We put Miss Nightingale's little work into their hands as a text-book; and, fortunately, the one nurse who remains of the set we started with is a woman of great experience, well able to instruct. Amid the many demands upon my time during the winter, I regret that more systematic means of instruction could not be adopted, but no opportunity was lost, and I hope during the summer to be able, by more special means, to increase the efficiency of the staff. . . ."

EDUCATION OF NURSES.

"The special means so much enforced in last Report for the education of the nurses were kept steadily in view throughout the year. Through the liberality of the Board a small library has been provided for their use, numbering above eighty volumes. It contains, in addition to works of general interest, such simple treatises on human anatomy and physiology as that published by the Messrs. Chambers for the use of schools; and during the winter they had an opportunity of seeing a set of large diagrams which the late John Henderson of Park was in the habit of lending for occasional use at popular lectures. . . . I have also put into the hands of my nurses note-books, and encouraged them to observe and record the various changes in the condition of the patients during their period of duty, the effects of the medicine administered, &c., with the result of cultivating habits of intelligent observation, and creating an amount of interest in their duties which could not otherwise be expected. The only difficulty has been in procuring the material which can profitably be subjected to this regimen. I only regret that, both from the smallness of the staff and the difficulty of recruiting it, so few come under the influence of the system. If prosecuted on a large scale in general hospitals, where the danger does not deter the sensible and intelligent from entering upon the profession, I am satisfied the result would be so evidently good that hospital surgeons and physicians would require for a nurse something more than a tidy woman with a white apron before her, and we should hear no more sneers at the idea of *teaching nurses anatomy*."

DIETARY.

"Food must be given judiciously in small quantities from hour to hour, day and night, without distinction. One patient is stupidly sleepy, and must be roused now and then to take milk or beef-tea, not waiting until he asks it; another is delirious, perhaps violent, and must be soothed, and only as a last resource restrained, which is the first notion of a bad and lazy nurse; another is obstinate or full of notions of poison in his drinks, and must be coaxed, or cheated, or overcome, in any way which will result in getting the nourishment into his stomach. Apart from such peculiar incidents, the majority, even in the ordinary course, are restless—tossing the clothes off, and requiring them to be put kindly on again—crying for drinks, and needing that they be given with a soft word, not with a scold for the trouble of it—in many respects being as helpless as infants, while yet having the weight and unwieldiness of adults. There is, I assert, no sort of nursing so laborious and exacting as fever-nursing. Let any one who would be convinced of this look into a ward in each department of the Royal Infirmary at any time, but especially at night. As a rule, in the medical and surgical wards things are quiet. The night-nurse may keep her seat, and give a draught of water when it is asked—help to shift out of an uneasy posture, or administer the medicine at the prescribed hour, and do her duty well with little labour. But in the fever wards there generally are noisy delirium, and distracting calls from various quarters, and constant occasions for lifting and turning, and patients for whom there is no motion of the body for any purpose, or to any extent, without aid or actual lifting as of a dead thing—when duties have to be performed, gently and with tenderness, from which naturally one would shrink. Indeed I have often stood at midnight and looked upon a ward full of males, mostly adults—one strong and violent, and strapped down—others helpless and dependent as infants—others restless, and no sooner calmed than up again, burning with some wild fancy; and then wondered at the courage a woman must have to pass the long hours of a night watch alone in such company, and still more at the rarer gentleness where such courage exists, which must combine with and soften its manifestations. Women enough are to be found who are callous and hard, equal to anything; who flock to a fever hospital, who protest their want of fear, who have had the 'fivver' repeatedly, and whose faces seem incapable of kindly emotion; who by sleeping draughts and strait-jackets make things snug, and enjoy a quiet sleep during the night—who nevertheless through the activity of their imagination and the extent of their 'experience' are able to give a marvellously natural and graphic account of how the patient 'passed the night' to the physician at the morning visit. We have depicted the harassing attentions required of the fever nurse. But suppose her to be one of this sort—suppose she neglects her duty, goes to sleep, gives no drinks, no medicine, no wine —suppose she even drinks the wine : how can the delinquency be detected? The fever patient is usually stupid and incoherent; and even when most intelligent, his statements cannot be safely trusted. But, indeed, one never hears of complaint even in such circumstances. A shrewd eye may see it written on the sunk face and parched tongue, and on their poor bodies in bed-sores; but otherwise a bad fever-nurse is without a witness against her. I might show further how much independence of judgment, how much manual dexterity in certain delicate operations which she ought to perform, are required to make a good fever-nurse; but I have already said enough to direct the attention of those who have fever wards or hospitals under their care, in the most pointed manner, to a scrutiny of their nursing as a part of the treatment of fever which lies close to the secret of success."

HOSPITAL CONSTRUCTION.

"The only disadvantage of the pavilion system is the area required for a hospital of any great extent of bed accommodation; and this is, financially, a serious matter in or near a large city. Considered as to mere fitness for the treatment of various infectious diseases, there is no doubt that separate buildings, conveniently near to one another, yet perfectly isolated, and preserved from infection by the intervention of open air, are much to be preferred to a system of wards piled one above another, separated merely by floors and partitions, and united by a common stair. Another practical advantage is the readiness with which patients can be transferred from the van to the ward, without being carried up flights of stairs; and also the tempting ease with which the convalescents can reach the open air for exercise without fatigue or the risk of meeting, in a confined space, the convalescents from any other disease which is being treated under one management. There has consequently been no instance of the intercommunication of such highly infectious diseases as small-pox, scarlet fever, or typhus, with each other, though all have been under treatment at once—a mishap which is not rare in hospitals differently constructed. Within the individual wards, also, the ventilation has stood very severe tests. For, to say nothing of their freedom from smell and sense of closeness, a very thorough test of the speedy dilution and dissipation of the fever poison by fresh air is afforded by the fact that I have treated all my cases of gastric fever, as well as such cases of pneumonia, bronchitis, and other diseases sent in by mistake as were not dismissed to the care of the parish or returned home, in the open ward with the typhus cases, as long as they were confined to bed, only taking care to *shift them immediately they became convalescent* to another part of the house. They were thus prevented from going to the fever, and in no instance has the fever come to them. A case of enteric fever, in which the patient was inadvertently put into the bed of a typhus patient, caught that fever. The Matron, also, I am thankful to say, though she performs her duty most efficiently, spending some time daily in the wards, has hitherto escaped, though she never had typhus. All this shows that very close contact with the persons of the patients is requisite to impart the poison in a form sufficiently concentrated to be infectious. It was in reliance upon this that Dr. Gairdner advised the admission of the 'relatives, and especially very near relatives,' in certain cases, and under certain conditions.[1] I have not met with any instance of infection attributable to this source, though, seeing that in most instances the fever is already at their houses, it would be difficult to trace the origin of fresh cases to the wards. Having spoken of this concession, which being novel was partly experimental, I may state that otherwise it has caused no inconvenience to us. It has been a source of gratification, as was anticipated, to many. It uncovers the usually mysterious interior of a fever ward, and leads to contentment regarding the issue of the illness, whether it be life or death, as the relatives see the patient is comfortable and well cared for. I also allow them to fetch little proofs of their thoughtfulness, such as biscuits, oranges, &c., provided they are all passed through my hands to the nurse. I have not found the privilege abused above five or six times by the hundreds who have been admitted; and as to corrupting the nurses with drink, &c., that is a thing which, as the staff improved in general faithfulness, became less and less likely. Indeed, only one such case has been reported to me."

---

[1] (Note by Dr. Gairdner in submitting Report.) This innovation led to remonstrances, at the time, from one or two of my medical friends, who regarded it as being more or less dangerous, on the ground of the probability of infection. I am fully persuaded, however, that the very slight, indeed almost inappreciable risk from this cause (admitting in theory that there may be at least some risk), is much more than compensated by the very important advantages here referred to by Dr. Russell. It is, indeed, a most extreme and (so to speak) superstitious view of fever infection, which would strain the consequences of the doctrine to the point of preventing all access of the public to a fever ward; and it would not be difficult to point out many evils arising from such exclusion far more serious than any conceivable amount of danger from the practice adopted in the City of Glasgow Hospital (W. T. G.).

DEFECTS IN EXISTING POLICY OF HOSPITAL PROVISION.

Indeed, it seems to me that the hospital treatment of fever in Glasgow has hitherto been carried out on principles which are in every respect erroneous. Looking back over the history of successive epidemics which have passed over the community wave-like, with intervals of remission, we find that each wave has been met by expedients extemporised in the midst of its onset. The money expended has been drawn from the public purse by different channels. Whether in the form of Parochial or Police Assessment, or of voluntary contributions to the funds of the Royal Infirmary, still the funds have been derived from one purse. Two evident disadvantages attend this *pro re nata* method. Large sums of money have been spent on perishable erections, and on the administration of those erections. The immediate crisis being passed, those temporary hospitals have been dismantled and their officials dispersed, leaving the City, after all, with nothing to represent the past outlay. Not only so, but valuable time is lost in hesitation, tampering with a disease which, being grappled with at once, might have been "stamped out," or greatly mitigated. We may arrive at a just estimate of such a method of dealing with fever by supposing the same principles to be applied to the City Fire Brigade. If, during a few months, no fire had broken out, and, urged by a popular cry of economy, our civic rulers sold their fire-engines and disbanded their staff of firemen, then half the City might be burned before the fire-engines could be reconstructed and the brigade reconstituted. Just so it is with our provision for the treatment of fever. One winter's epidemic seizing upon the community will absorb the entire saving of years in which fever has been comparatively absent. One generation is economical, but only at the expense of another. Let us apply the same principles to the economics of fever as prevail in ordinary business transactions. The loss of one year is taken into account with the gain of another, and while the balance of one year may be unfavourable, the balance of a series of years displays a profit. These ordinary business principles have never yet been brought to bear on the management of fever in Glasgow; and the consequence is, that during the past twenty-five years an amount of public money has been expended through various channels which, if concentrated on the erection and maintenance of a permanent hospital or hospitals, would have placed the community in the position of being always prepared, and, taking one year with another, would have resulted in a clear saving. There are also advantages which cannot be represented in sums of money; and it is true that some disadvantages are more apparent than real. A fever hospital standing empty is being purified for future use. During the moderation of the disease, the wards may be occupied in rotation. Above all *it exists*; and in place of an intermittent outpouring of money on temporary and imperfect preparations, the public have no doubt a stated annual expenditure, but also permanent efficiency. The time for deliberating about a Fever Hospital is during the interval *when there is no fever in the City*. We surely do not require to *see* the disease actually ravaging the people before we can be convinced that it is necessary to spend money in providing accommodation for its victims.

CHAPTER III.

GENERAL RESULTS: 1875-1894.

DEVELOPMENT OF ADMINISTRATIVE ACTION

The last of the great Epidemic prevalences of Typhus Fever had occurred in Glasgow in the year 1869-70, when over 2000 cases were treated in Kennedy Street Hospital; and the administration was now at liberty to develop its attack against other forms of infectious disease.

Early in the present period, co-operation with the School Boards was invited in order to obtain early information of infectious diseases among school children; popularly worded leaflets on the management of Scarlet Fever, on the law regarding infectious diseases, and on the care of children were issued; smoke testing of drains was introduced; methods of refuse removal reformed; District Baths and Wash-houses were provided.

The beginning of the period also saw considerable displacements of population from insanitary areas, and the establishment, by the Improvement Trust, of Model Lodging-houses.

In the later years of the period the first installation of a system of Sewage purification was opened at Dalmarnock, and a beginning had been made with the provision of children's playgrounds.

The average death-rate of the years 1873-4-5 was 30.6; of the years 1892-3-4, 21.9 per 1,000.

The narrative in detail is now continued from the volume on "Evolution."—(Ed.)

This period reaped the first-fruits of the steady work of the Sanitary Department and the operation of the City Improvement Act. The campaign against infectious diseases was pushed home. The ordinary "Fevers" having been subdued, attention was turned to the now more destructive infectious diseases of children. A system of co-operation with the School Board to prevent their dissemination through schools was established. In olden times the highest demand of reformers was that there should be disinfection of house and clothing, &c., after removal to hospital. Under the new regime the practice as regards clothing was extended to washings during the currency of cases of fever treated at home. The systematic attack on the (so-called) minor infectious diseases meant, therefore, not merely hospital treatment where possible, but a vast

1875-1884.

Mean Population, 511,302.

SANITATION.

1876.	Hospital Treatment of Infectious Diseases wholly in the hands of Municipality.
1871-79.	7 District Model Lodging Houses erected.
1877.	Small-pox Hospital, Belvidere, opened.
,,	*Streets Improvement Act.*
1878.	*Public Parks Act.*
1878-84.	5 District Public Baths and Wash-houses erected.
1879.	DAIRIES AND MILK-SHOPS ORDER.
,,	Fulwood Moss leased.
1880.	*Improvement Act Extension Act.*
1881.	First Refuse Despatch Work opened.
,,	Arrangement made with Registrars for Returns of Vaccination Defaulters.
,,	Resolution to admit all Citizens free to Hospitals (April).
1882.	Systematic Drain Testing begun.
1883.	New Municipal Washing and Disinfecting Establishment opened at Belvidere.
1884.	Second Refuse Despatch Work opened.

Ten Years, 1875-84.

32 Articles Washed, &c., per case of Infectious Disease registered.

15 "Nuisances" removed per annum per 100 houses inhabited.

Two Years, 1883-84.

683 Drain Tests per annum.

HEALTH.

1875.	Milk Epidemic of Enteric Fever—Washington Street, Pollokshaws Road, and Kingston.
1877-78.	Milk Epidemic of Enteric Fever—West-End.
1880.	Milk Epidemic of Enteric Fever—North and Central.
1884.	Milk Epidemic of Enteric Fever—Hospitals.

Ten Years, 1875-84.

Birth-rate, - - - - -	39·4
Death-rate, - - - - -	26·9
Highest Death-rate (1875), -	30·8
Lowest do. (1879), -	24·6
Death-rate under one year per 1000 born, - - - -	150
Death-rate, Zymotic Diseases,	5·05

increase in the labour of disinfection. Every case of infectious disease entailed service. In such diseases as Scarlet Fever or Enteric Fever treated at home, there was service distributed over a long illness as well as on recovery. Dirt in the house was treated as a bad thing, which it was of public advantage to get rid of by such a revolution as the presence of an infectious disease even of the minor sort gave one a legal right to effect. In this way thousands of houses were at least once in a year made thoroughly clean. The number of articles of bed and body clothing washed per case registered, which in 1865 was only between four and five, rose in the first four years of the extended department (1871-74) to 7, and in this decade, with its widened scope and increased facilities, to 32.[1] Something had also been learned as to the conditions most conducive to success in the application of preventive measures. Experience had taught that from first to last, wherever it existed, infectious disease must be dealt with by one authority, and that any condition of payment interfered with the adoption of preventive precautions. The whole hospital treatment of infectious disease was undertaken by the authorities, and it was resolved to admit every person living within the area of the rates free of charge, and also to make all services of washing and disinfection free to everybody. A much enlarged and better equipped washing and disinfecting establishment was opened at Belvidere. The most important step in the nuisance department was the commencement of the systematic application of the smoke-test to drains, which has now developed greatly both in the efficiency of the apparatus and the frequency of its use. The number of "nuisances" removed per 100 inhabited houses rose from 10 in the first four years of the new department (1871-74) to 15 in this decade. The whole method of refuse collection and removal had been gradually reformed and systematised. In place of the huge "manure depots" which used to disfigure the outskirts of the city, "Refuse Despatch Works" were erected where the refuse was disposed of daily as collected, by despatch to the country either to customers or refuse farms leased or purchased by the cleansing department,[2] or by cremation. The aggregate result was a steady diminution in the quantity of offensive matter to be found within the city at any one time, more especially in the vicinity of the dwellings of the people. Cleanliness of person and of clothing was greatly facilitated and promoted by the erection (1878-84) of district Baths and Wash-houses.

---

[1] On the average of the years 1900-4 the number of articles washed per case registered was 34.

[2] In 1879, 98 acres of Fulwood Moss were taken on a 31 years' Improvement Lease. In 1887, 25 acres were added. In 1891, the estate of Ryding, 565 acres, was purchased. The refuse of the city makes the desert to rejoice and blossom as the rose.

The area originally scheduled under the Improvement Act extended to 88 acres, inhabited by over 51,000 persons, and situated chiefly in the Central District, partly in Gorbals and Calton. The borrowing power was £1,250,000. The Act was amended in 1871 and extended in 1880, when the borrowing powers were raised to £1,500,000. Streets Improvement Acts, with borrowing powers to £370,000, were obtained in 1873 and in 1877, which in effect were supplementary to the Act of 1866, leading not merely to improved communication in various places, but to the acquisition of a considerable amount of inferior property in Anderston, which has since been transferred to the Improvement Trust. This Trust made little outward show as a reforming agent until 1870, but between that year and 1877 it carried out extensive clearances and partial reconstructions in the scheduled area, besides purchasing two estates on the outskirts and laying them out with liberal air space for working class dwellings. Between 1871 and 1879 the same Trust erected seven Model Lodging-houses in as many districts, thereby killing off the greater number of the inferior private lodging-houses and attracting lodgers from small private houses. When to these operations by the authorities we add the breaking up of slums incidental to extensive railway undertakings, we may characterize this period as one of revolution in the proverbial Wynds and Closes of the City, and of re-housing of a large proportion of their inhabitants.

Probably the most important event in the sanitary history of Glasgow in this period was the resumption by the Improvement Trust in 1889 of an active policy of demolition and reconstruction. To speak frankly, between 1877 and 1889 the Trust had stood still, and was in fact the largest owner of unwholesome property in the city. True, much had been done to improve this property, but the fact remained that it had been purchased for the very purpose of demolition, and nothing short of demolition would meet the necessities of the case. The explanation, and so far the excuse, for this attitude of the Trust was that, like other holders of property in the commercial crisis of 1878, it suddenly found itself without a profitable market for its land, and, like all holders of property who could afford to do so, it held for a rise. It is an open secret in municipal circles that the Committee on Health found its progress blocked by this position of the Trust. It was impossible to deal with other landlords and leave the Trust alone. In fact, no other landlords held such property, certainly in quantity, probably even in quality. A private survey of the Improvement Trust property was made by the Medical Officer, and a report thereon with plans drawn up and submitted to the Chairman of the Committee on Health (Mr. Crawford[1]). A special committee was appointed to inspect the property complained of. The reports of these inspections were forwarded from time to time to the Trust, and ultimately it was pressed into that course of demolition and reconstruction on the ground thus cleared and laid out anew, which has since been steadily followed. It may be said that the proverbial Wynds and

1885-1894.

Mean Population, 588,613.

SANITATION.

1885. *Glasgow Corporation Water Works Act.* (Extension of Loch Katrine Works.)
1887. Belvidere Fever Hospital completed.
1889. Improvement Trust resumes reconstruction.
,, Resolution of Committee on Health condemning the Privy System.
,, Tuberculous Meat Case.
1890. *Glasgow Police (Amendment) Act.*
,, THE HOUSING OF THE WORKING CLASSES ACT.
,, INFECTIOUS DISEASE (NOTIFICATION) ACT, adopted 1st January.
,, Third Refuse Despatch Work opened.
1891. *City of Glasgow Act* (1st November) Extension.
,, Ryding Estate purchased.
1892. Second Reception House opened.
,, Site acquired for Fever Hospital, Ruchill.
,, *Building Regulations Act.*
1894. First Sewage Purification Work opened (May)
,, New Bye-laws—Cow-houses and Byres.
,, Washing and Disinfecting Establishment for North and West, opened at Ruchill (October).

Ten Years, 1885-94.

43 Articles washed, &c., per case of Infectious Disease registered.
18 "Nuisances" removed per annum per 100 houses inhabited.
2,540 Drain tests per annum applied. (5,390 in 1894.)

HEALTH.

1888. Milk Epidemic of Scarlet Fever—Garnethill.
1892. Milk Epidemic of Scarlet Fever—Paisley Road.
1893-94. Milk Epidemic of Scarlet Fever—Kelvinside.

Ten Years, 1885-94.

Birth-rate, - - - - - -	35
Death-rate, - - - - -	23·2
Highest Death-rate (1885), -	25·3
Lowest ,, (1894), -	19·9
Death-rate under 1 year per 1000 born, - - - - - -	144
Death-rate, Zymotic Diseases, -	3·8

---

[1] Afterwards LL.D. (Hon. Causa), Glasgow University, 1902.

Closes have now ceased to be. The special feature of these operations is that the Trust, having failed to get its land feued in the ordinary way, is itself building, with the result that ultimately Glasgow will exhibit another development of what has been called "Municipal Socialism," but like her other enterprises of the same nature, not aimed at or advocated under a general theory, but reached on the lines of business expediency applied to each question as it arose in the course of municipal life.

It was in consequence of the observations made by the special committee referred to above, that the Committee on Health (March, 1889) formally recorded their condemnation of the privy system in these terms :—"In our opinion the privy is in no case a sufficient provision for flatted tenements. It is never used, and cannot in the nature of the case be used, by females, and seldom by children. The result is that every sink is practically a water-closet, and the stairs and courts, and roofs of outhouses, are littered with deposits of filth cast from the windows. Some form of wash-out closet, in the proportion of one to every two or, at most, three families, ought to be provided, as far as possible in a back jamb." The importance of this resolution cannot be exaggerated. It struck at the root of all that filth in the Wynds and Closes, which was so prominent in the criticisms of visitors, but could scarcely be described. It singled out the one element in the circumstances of the inhabitants which thirled them to indecency and made immorality natural. The practical outcome of this resolution was the introduction of a clause in the Amendment Act of 1890, the application of which has begun a revolution in the tenement houses of Glasgow which is yet only in mid career. The Committee at the same time expressed the opinion that supervision by resident caretakers is necessary in tenements, and directed the attention of the Trust to the prevalence of farming out of small houses in their property. These observations also have borne fruit in voluntary action, though they have not yet become the subject of legislation.

The completion of the permanent structure of Belvidere Fever Hospital, the acquisition of the estate of Ruchill where, taking advantage of the experience gained at Belvidere, another hospital is being erected, and another Washing and Disinfecting establishment is already in use for the north-west quarter of the city, show that the resources for dealing with infectious disease are keeping pace with the growth of the city. The adoption of the Infectious Disease (Notification) Act on 1st January, 1890, brings automatically into the hands of the Medical Officer information for which his staff had laboriously to seek. The Police (Amendment) Act of 1890 adds to the stringency of the powers for dealing with infectious disease, and in respect of drains, conveniences, overcrowding, lodging-houses, disease in dairy cattle, and uninhabitable houses, &c., &c., gives Glasgow, on the whole, the benefit of the advances in sanitary law following up the advance of sanitary knowledge, from which Scotland in general is shut out by the neglect of her interests in Parliament. The systematic removal of refuse, and the daily disposal of the daily collection have been further developed, and the great and necessary task of purifying the Clyde begun by the opening of the Dalmarnock Sewage Purification Work in 1894.

In this period systematic efforts were for the first time made to provide Children's Playgrounds. The city has always been supplied with suburban parks. The historic Glasgow Green was purchased at various times in the 17th and 18th centuries. It remained the sole park until 1854, when the West-end Park was obtained, and several new parks and large additions to old ones have since been acquired from time to time. Still no provision had been made near to tenement houses, for the use of children, of smaller spaces such as may be found near all our large self-contained houses in the shape of *pro indiviso* gardens or pleasure-grounds. George Square, St. Enoch Square, St. Andrew's Square are examples of spaces left near the houses of the wealthy of former generations which remain for the use of the many. The City Improvement Trust left spaces in feuing Overnewton and Oatlands for tenements, and in the course of laying out afresh areas which had been cleared reserved useful vacant plots, of which Cathedral Square and Bain Square are examples. The negotiations preliminary to the extension of the city in 1891 led to several of these more modest play-places being bargained for as a condition of consent. Still there was no effort here to redress the wrongs of the past. These negotiations showed that the people of the present were alive to their interests, and although still in close touch with the green fields, were determined to anticipate the day when the growth of the city should cover them. Power was obtained in 1878 to lay out and throw open the graveyards which had been closed. Six of these now furnish attractive spaces in the midst of crowded localities in the oldest parts of the city, and make one thankful that the necessity of "the possession of a burying place" preserved from the builder of former generations some space of which the living now enjoy the reversion. Since 1892 the Committee on Health has made it a part of its ordinary business to secure, as opportunity offers, play-places for the children of the poorer and more crowded localities. There is a special Sub-Committee for the purpose. The noblest of these acquisitions hitherto is "Phœnix Square."

which, in place of being one of the grimiest, most repulsive spots in the city, now smiles in the sunshine and echoes with the laughter of happy children. From Mr. MacLellan's interesting book on "Glasgow Public Parks" we find that in 1893 the parks and spaces extended to 700 acres, of which about 30 were distributed in smaller plots near the houses of the people.

We have seen that, naturally and logically, along with the project of improving the Wynds and Closes, came into the minds alike of individual reformers and of the authorities themselves the conviction that new buildings must be controlled and supervised in the interests of public health. This in Glasgow meant that power must be put into the hands of the Dean of Guild Court. This was begun in 1843 and 1846, and considerably extended in 1862 and 1866. Following the historic and natural course, no sooner was the representative mind compelled by the special inspection of Improvement Trust property, and the revived interest in the physical environment of the dwelling-house, to consider closely the conditions which made existing buildings unhealthy, than the necessity for a thorough revision of the powers of the Dean of Guild Court was borne in and recognised. Hitherto, too much in detail had been left to the discretion of the Court and the Master of Works for the time being, even in matters regarding which they had general powers, while there were other matters regarding which they had no power or only a restricted power. The result was Glasgow's first Building Act passed in 1892. Another generation will reap the benefit of it. The Municipal Extension Act of 1891 made the Building Act very opportune, because it is in the suburbs that the future of Glasgow, so far as house building is concerned, is being made or marred. It is to be regretted that this measure did not accomplish the same end as the Extension Act of 1846—bring together into the fulness of one corporate life *all* the dissociated administrative fragments of this great community. Nevertheless there is enough in the promise of progressive returns from that which has long ago been accomplished, and of a fresh harvest from that which has only just been inaugurated, as well as from the entirely new enterprises which lie in the future of a city which has never failed of intelligence and courage in administration to warrant the expectation that the vital statistics of the next decade will prove that Glasgow has kept up the running in the race of progress.

In an appended diagram, the rate of mortality during the last forty years is shown, and the proportion of the total rate contributed by—(1) Zymotic Diseases; (2) Phthisis; (3) Other Diseases of the Lungs; (4) The Balance of Miscellaneous unclassified Diseases. The following Table reduces this annual to a decennial statement, the figures being death-rates *per million*.

	Zymotics.	Phthisis.	Other Diseases of Lungs.*	Other Causes.	All Causes.
1855-64 - -	7,841	3,918	5,170	13,121	30,050
1865-74 - -	7,377	3,940	6,522	12,692	30,530
1875-84 - -	5,056	3,396	6,322	12,113	26,886
1884-94 - -	3,822	2,458	5,329	11,566	23,175

* Exclusive of Croup.

If we compare the first with the last decades, we find the following results—

A Decrease of 4,019 or 51 per cent. in the Death-rate from Zymotics.
Do. 1,460 or 37 do. do. do. Phthisis.
A Increase of 159 or 3 do. do. do. Other Lung Diseases.
A Decrease of 1,555 or 12 do. do. do. Miscellaneous Diseases.
Do. 6,875 or 23 per cent. in the General Death-rate.

In short, if we divide the whole balance of gain into two, we find that it amounts to 4019 lives per million saved from the tribute formerly levied by Zymotic Diseases, and 2856 from the tribute of all other diseases, or 58 per cent. of the total saving from the former, and 42 per cent. from the latter.

POSITION OF INFECTIOUS DISEASES IN HISTORY, SCIENCE AND PRACTICE OF PUBLIC HEALTH.

This result is doubly interesting. It is consistent alike with the history and with the science of public health. The history of sanitation in Glasgow is recorded in the preceding pages. It is merely a particularly striking illustration of the history of sanitation at all times and in all places. Sanitation is primarily the outcome of selfishness, a simple effort on the part of the community or the thinking governing part of it at self-protection. Ultimately it becomes altruistic, or at anyrate when the plagues are gone it has passed into a habit, although still Cholera is more effectual as a stimulant to the soporose than a discourse on altruism, or even Christianity. Hence it is that sanitary administration, like an infant Hercules, struggles in its cradle with the serpent brood of infectious diseases, and their destruction is naturally the first evidence of its prowess. But this instinctive effort intelligently directed leads to precisely the same works and executive procedures as the most abstract study of the scientific principles of public health undertaken by the most altruistic of philanthropists would reason out. Exactly the same physical conditions which nourish and sustain epidemics promote chronic ill-health. If we could find a community with a permanently high death-rate and no epidemics, we should find uncleanness of air, water, soil,

I. GLASGOW.—Death-rates per Ten Thousand for 40 years (1855-94), showing proportion due to Zymotics, Phthisis, and Acute Diseases of the Lungs.

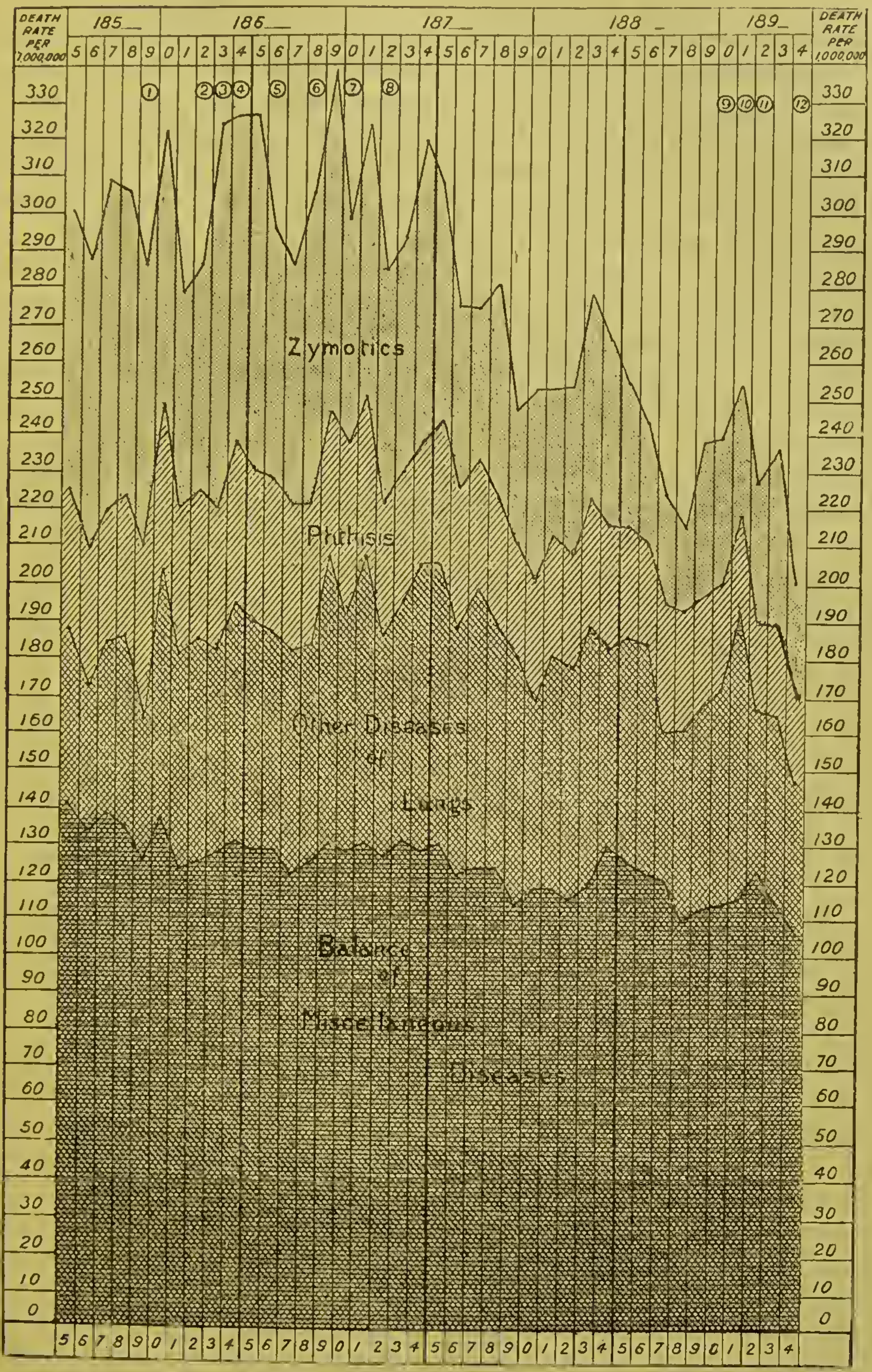


Diagram No. 1. Historical References.

(1) Loch Katrine Water turned on. (2) Police Act (1862). (3) First Medical Officer of Health appointed. (4) First Municipal Fever Hospital. (5) Police Act (1866). City Improvements Act. (6) Cleansing taken over by Municipality, and Cleansing Department organized. (7) Sanitary Department organized. (8) Scotch Education Act. (9) Police (Amendment) Act. Notification Act adopted. (10) The City of Glasgow Act. (11) Building Regulations Act. (12) First Sewage Purification Work opened.

if not co-existent, at anyrate in various combinations, expressing themselves in the detail of slums, want of drainage, want of conveniences, impure or imperfectly distributed water, overcrowding, personal and household dirt, &c., &c. The clue to sanitary work is to follow infectious disease into the houses of its victims, whether they live in the Wynd or the Crescent. It brings you not merely to the place where disinfection is wanted and isolation may be expedient, but to the place where the technical " nuisance" may be looked for. In the Crescent, infectious disease sharpens the senses and quickens the critical faculty of the householder; in the Wynd, it enables the sanitary inspector to elicit complaints of nuisance hitherto endured without murmur, and gives him the chance of discovering others undreamt of. In neither case does it matter whether the nuisance has anything or nothing to do with the particular disease. Etiology may be left to others to discuss. Sewer gas does no good, whether it causes diphtheria or not. The business of the medical officer is to get rid of it first, and afterwards to find out if he can what particular part it plays in the depreciation of health.

CHAPTER IV.

THE HISTORY OF HOSPITAL ACCOMMODATION FOR INFECTIOUS DISEASES IN GLASGOW.

(*a*) GENERAL. (*b*) THE POLICY AND PRACTICE OF GLASGOW IN THE MANAGEMENT OF EPIDEMIC DISEASES.

THE pages of "Evolution," in which the history of hospital provision for the treatment of infectious diseases is sketched, may form a prelude to the more detailed discussion of the subject, as presented to the Epidemiological Society of London in 1881.[1]

Practice, however, crystallises into policy only through a long period of experimental working along lines more or less tentative in character, and so we find in the Kennedy Street Hospital Reports recurring references to the functions of a fever hospital in relation primarily to the treatment of the infectious sick, but also, as affecting the spread of the particular disease under treatment. "The *prevention* of disease is the function of the Local Authority. Its *treatment* may devolve on various public bodies, according to accident or special circumstances. . . . It is quite possible *to treat* 'contagious' diseases in the most perfect way so far as the sick individual is concerned, and yet to fall short of perfect precautionary measures for the prevention of its spread."

The question was raised in an acute form at this time by a proposal of the Directors of the Royal Infirmary to the Board of Police to erect a Convalescent Home for Small-pox patients. The duty of the Infirmary to the patient ended when he could be discharged without injury to himself; whether he might still be capable of spreading disease to others was a question which did not primarily concern them as an institution maintained by public subscription for the specific purpose of treating disease only. The solution was ultimately to be found in unifying all the interests concerned with the repression of infectious disease by the Local Authority making provision for the care of the infectious sick during the entire period of his infectivity.—(ED.)

---

[1] "The Policy and Practice of Glasgow in the Management of Epidemic Disease." *Trans. of the Epidemiological Society*, New Series, vol. i., Session 1881-82.

A CENTURY OF HOSPITAL HISTORY.[1]

Hospitals not only bear an important part in the prevention of infectious disease, but indirectly also in the education of local authorities. They give concrete expression to the costliness of slums and nuisances. I propose, therefore, to expand into more detail this department of the sanitary history of Glasgow.

The Royal Infirmary, opened in December, 1794, became at once the centre of all hospital treatment of Fever in Glasgow. It contained 150 beds, and even in the first five years of its existence 14 per cent. of the patients treated suffered from "Fever." In 1816 the beds were increased to 230, and the addition is reported in that year to have been "found of incalculable use as a receptacle for persons with low Fever, the multitudes of whom, flocking from the closes, and ill-aired alleys and lanes of the city, have of late exceeded all precedent." In 1818 no less than 60 per cent. of all the patients admitted had "Fever." A temporary Hospital with 200 beds was erected by public subscription at Spring Gardens, and kept open from March, 1818, to July, 1819, during which time 1929 patients were treated. This hospital was again opened for five months in 1827 at the expense of the Royal Infirmary. The directors resolved to proceed with the erection of a separate permanent "Fever House," because "in this large city Typhus Fever must be at all times liable to occur, and in the narrow and crowded Vennals and Wynds it must be frequently apt to break out with virulence, so as to endanger the whole town." Next year they were compelled to erect within the Infirmary grounds "a temporary wooden booth," which contained about 80 beds. In 1829 the Fever-house was half finished and 100 beds provided. In 1832 it was completed with 220 beds. In 1831 a "Board of Health" had been formed by the Magistrates, and a cotton mill in King Street, Mile-end, secured, and put under the managers as a Fever Hospital, with 135 beds. Next year they report that, after being supported for three months by the Board of Health, its funds were exhausted, and the managers had kept it open at their own cost. In 1837 the permanent Fever-house was overflowing, and the managers opened a temporary hospital, with 60 beds, in Albion Street, which was in use from March of that year until April of the following. They also bought a site to the E. of St. Andrew's Square, near the Green, but did not require to use it. In 1846 the Fever was rising. The Fever-house was full. In January, 1847, they arranged to get the use of the Lock-Hospital in Rottenrow, just finished. In a month the 70 beds were full, and patients were again being turned away. The managers resolved to build on the site acquired in 1837, but the neighbouring proprietors threatened the strongest opposition. They sold the ground and purchased a large new building in Dalmarnock Road. At once a proprietor applied for an interdict which they resolved to oppose, but meanwhile the Fever could not be interdicted, and, at their wits' end, the managers proceeded once more to erect temporary wooden sheds for 140 patients in their own grounds. These were opened on 24th June. In two days 80 cases were admitted, and in a few days more the sheds were full. By the Poor Law Act of 1854 important auxiliaries in dealing with popular sickness had been created. Hitherto the Parochial Boards of Glasgow had merely sent their patients to the Infirmary at £1 per head, but the City Parish, finding the resources of the Infirmary exhausted, resolved to secure the old Town's Hospital in Clyde Street which had been for some time out of use. It was opened on 7th July, when between 70 and 80 patients were admitted in one day, and so day by day until the 634 beds from time to time provided were full. On 5th August wooden sheds erected by the Barony Parochial Board in Anderston were opened, and their 250 beds likewise speedily filled. In this year the total beds provided in Glasgow was 1254, and the number of patients treated was 11,425, the maximum on record in both cases. Of the District Surgeons and hospital medical staff, 18 took Fever and 8 died; of the inspectors, matrons, nurses, and servants, 99 took Fever and 22 died. In 1848 the parishes closed their hospitals and resumed sending their cases to the Infirmary, but now at 15s. each!! The managers sold their ground and building in Bridgeton, their right to use which they had defended before the Sheriff-Substitute, the Sheriff-Principal, and the Court of Session, but only established when success was of no value except as a precedent. In the winter of 1851, the wooden sheds of 1847 were reopened, and again in 1852, notwithstanding which cases were refused and the parishes had to resume hospital treatment. Then Fever declined and continued at a moderate level until 1862. In 1863 the managers report that of 1852 cases of fever and small-pox treated half had been sent in by the Glasgow Parochial Boards; that they had been unable to accommodate all applicants, and that they raised their charge per case to £2. The newly-appointed Medical Officer of Health found this difficulty awaiting him and met it by stimulating the Parochial Boards to provide accommodation for paupers, while the Police Board, through the "Magistrates' Committee," gave to others "lines" on the Infirmary. This resource soon failed. Numerous conferences were held between the Parishes, the Managers of the Infirmary, and the Authorities, in which the managers referred the latter to their powers under the 1862 Act, and the Police Board at last "arranged to provide temporary accommodation for such cases as do not fall within the province of the Parochial Boards to deal with, and which it is impossible for the Infirmary to take in."[1] An effort was made to get some existing building, which ended in the fiasco of the old mill, Nassau Court, Anderston, already recorded. Then "Parliamentary Road Hospital"[2] was projected and opened in April, 1865—*The first Municipal Fever Hospital.* Still it was, in accordance with the Act of 1862, a mere temporary provision made to meet an epidemic emergency. The legal difficulties with which its existence was threatened were overcome by the renewal of the emergency powers every six months until, with the passing of the 1866 Act, its tenure of life was made secure, and the maintenance of fever hospitals by Glasgow became a necessity.

---

[1] From "The Evolution of the Function of Public Health Administration, etc."

At the date when the new hospital brought its 136 beds to the help of the fever-stricken community, each of the Parishes had fever-wards in its Poorhouse, viz.—City, 100 beds; Barony 120; and Govan 54, so that the total bed accommodation, including the Infirmary, was 610. From this time onwards a gradual absorption by the local authority of the treatment of infectious diseases in hospital took place. The Parishes in succession closed their fever-wards, the Infirmary cut down its accommodation, still giving a friendly arm to the local authority until the waves of epidemic had sunk quiet. In 1865, 1866 and 1869, the Police Board subsidized "the Royal." In 1870, "Parliamentary Road" was increased to 250 beds, and the same number was provided at Belvidere, but in hot haste under epidemic pressure and therefore much more temporary in material and workmanship than "Parliamentary Road," which is as useful to-day as it was 30 years ago. Hence, during the 17 years, 1870-1887, there was a constant process of substitution and extension going on at Belvidere, resulting in a permanent Fever Hospital of 390 beds. In 1878 a permanent Small-pox Hospital had been completed at Belvidere, and "Parliamentary Road" which had been reserved for Small-pox for some years was reduced to 120 beds, closed and held as an overflow for Scarlet Fever. The demands of that disease became so great in 1893 that 80 beds were added to it and it was resolved to erect a hospital in the North-west of the city with 440 beds, on the completion of which the site of Parliamentary Road will be abandoned, leaving a net gain of 240 beds and increasing the total accommodation of the city to 980 beds.

---

[1] Royal Infirmary Report for 1864.

[2] Also known as "Kennedy Street" Fever Hospital.

DEVELOPMENT OF MUNICIPAL POLICY AS TO INFECTIOUS DISEASES.

It appears from this narrative that the local authority took to the hospital treatment of infectious disease in pursuance of no great policy, but as a mere temporary expedient. It was not proposed to treat all cases, but the surplus of the Parochial Boards and the Royal Infirmary and not to provide always for treatment but only so long as there was a surplus. It therefore recognized within the category of infected persons distinctions which conditioned their relation to the local authority —the pauper case, the case which had a " line of admission " to the Infirmary, and the balance who were not paupers and who either could get no line or who could get no value for their line, the Infirmary being full. If an epidemic inspector came across what seemed to him to be a pauper case, the inspector of poor was asked to remove it. He always inquired into the facts. He might dispute the pauperism. If not, still the course was not clear. The patient might be legally a pauper, but only under stress of the fever, and he might refuse to be pauperized. The patient might be actually on the poor-roll and still might refuse to go to hospital because of prejudice against " the house." If the patient had a line for the Infirmary some time had been spent in getting it, so that removal to the Poorhouse or to the Infirmary was always a slower process than removal to the civic hospital. If the patient, not being a pauper and not having a " line " for the Infirmary, seemed able to afford it or was a dependent of some one who could, a charge was made for treatment by the local authority. When the parishes gave up their fever-wards, the inspectors of poor sent their orders for the removal of paupers to the Sanitary Department and paid for their treatment. To obviate delay in dealing with cases apparently paupers which came first to the cognizance of the Sanitary Department, an agreement was made that they should be at once removed and coincidently a claim sent to the parish. When the managers of the Infirmary discovered that Small-pox spread among the patients in the general hospital and applied to the Local Authority to honour all their Small-pox lines, the Local Authority consented only on condition that for patients living within the municipal boundary one pound should be paid, for those living outside, two (1871).

Then the Local Authority discovered that Small-pox prevailed in the neighbourhood of their Small-pox Hospital to a suspicious extent and they declined to receive through the Infirmary persons who were not citizens and who might infect those who were. The managers thereupon (1872) refused to deal in any way with lines given to Small-pox cases and referred everyone to the Sanitary Department. In 1876 they adopted the same course with "Fever" recognising at last that it was impolitic to spend charitable funds upon persons suffering from diseases, the treatment of which was provided for by assessment. Still the Local Authority continued to complicate their otherwise simple function by maintaining a distinction between infection in paupers and infection in other people. The sanitary inspector kept ledger entries against the parishes for treating real or imaginary paupers, and rendered periodic accounts, of which a constantly increasing proportion consisted of the item "To amount of account rendered." Concurrently there flowed on correspondence, conferences, veiled threats of law, proposals of composition, payments for persons already on the pauper roll, as to others repudiation; until at last the absurdity of the whole situation became apparent and the Local Authority on 23rd April, 1881, cut the Gordian knot by resolving "*that all classes of the citizens suffering from infectious disease should be treated in hospital without any charge being made therefor.*" The fact was that in Glasgow no citizen suffering from infectious disease had been treated in a parochial hospital since 1872, or in a general hospital since 1876. What was now done was to municipalize the hospital treatment of infectious disease and so to dissociate it from all social depreciation whether of pauperization or of charity. This really carried with it the whole sanitary service of the city incidental to the control of infectious disease. In the Glasgow Police (Amendment) Act of 1890 (Section 6) the Glasgow Authorities bound themselves to this policy, which was developed from no social theory but from the observation that any condition attached to the isolation in hospital of a citizen, over and above that of being infectious, hindered isolation and therefore impeded prevention, and so with every public service associated with prevention.

The refusal of the Glasgow Authorities to admit cases of infectious disease from outside the city through Infirmary lines into the municipal hospital, and the recognition by the managers as dispensers of charity of their true relations to infectious disease had indirectly such important effects upon the policy of local authorities in the neighbourhood of Glasgow that a few lines must be devoted to this point. The Infirmary of Glasgow has been depicted as the centre of the hospital treatment of infectious disease only so far as the city was concerned, but it really was so also to the suburban and neighbouring districts. The shutting of the Infirmary against Fever at once brought applications to Glasgow from two quarters (1) from persons living in these districts, (2) from the authorities of these districts. Gradually the true policy of the situation became clear. Private applicants were referred to the local authority within whose jurisdiction they lived. Local Authorities were assisted at a fixed rate so long as the requirements of the city permitted and on their undertaking to set about providing hospitals for themselves as soon as possible. In this way it may be said a salutary process of education was carried on around Glasgow both of constituents as to their rights, and of local authorities as to their duties, the fruits of which were soon manifest in their equipment. Many a rural ratepayer heard for the first time in the Sanitary Office of Glasgow of the duties imposed and the rights conferred by the Public Health (Scotland) Act on their representatives and themselves respectively.

STATISTICS OF THE GLASGOW FEVER HOSPITALS, 1865-94.

The gross number of patients treated in those 30 years was—

	Treated.	Died.
Parliamentary Road,	16,796	1,807
Belvidere (Fever),	56,320	6,195
Do. (Small-pox),	1,179	71
Grand total,	74,295	8,073

The principal diseases from which these patients suffered were—

	Treated.	Died.
Scarlet Fever,	22,982	2,080
Typhus,	11,255	1,417
Enteric Fever,	8,846	1,268
Measles,	8,356	717
Relapsing Fever,	4,901	102
Small-pox,	4,232	620
Whooping-cough,	3,210	618
Erysipelas,	1,447	120
Diphtheria,	617	261
Cholera,	21	13

THE POLICY AND PRACTICE OF GLASGOW IN THE MANAGEMENT OF EPIDEMIC DISEASES, WITH RESULTS.[1]

Differentiation of function is the characteristic feature of the growth and development of communities as it is of the evolution of animal life into higher forms. In the course of time, the various organisations essential to the existence of a community shape themselves out in response to the increasingly complex conditions of its life; but it is only after many trials and many failures that the various functions necessary to be performed are properly distributed and discharged. The care of the public health in a city is one of the most important of these functions. It concerns every class, in all circumstances. Yet it will be found, especially in old countries, where municipal development has followed internal local impulses through many centuries, that the proper differentiation of this function is more slowly attained than that of any other. The reason seems to be this, that there is something in public health, and the measures required for its conservation, more or less akin to the objects of several of the departmental organisations of a community which come into existence prior to the recognition of the public health as an imperious subject of administration. The tendency, therefore, naturally is to try each of these organisations in succession, as the organ of this new function, or to distribute the function among them, deriving a little service from each as occasion presents, or as their primary ends permit, in the hope that thus the entire area of public health requirements may be covered.

---

[1] *Transactions of Epidemiological Society of London.* New Series, vol. i., Session 1881-2.

There are thus recognisable in the history of cities distinct stages in the evolution of a policy in public health administration. My object now is to illustrate these stages from the history of Glasgow. It is only with that department of public health administration which relates to the management of epidemic diseases that I propose to deal. But it is notorious that the fiery heart of all the energy ever thrown by cities or nations into sanitary work is the epidemic. At first, this energy is only a spurt put on to pull the boat past threatening annihilation; but, gradually, the steady, quiet swing of daily work makes those spasms of excited exertion unnecessary. Not only is epidemic disease always, and in all places, at the centre of sanitary activities of all kinds, but of all the objects of sanitary administration, the control and repression of epidemic disease depends most for a successful issue upon proper differentiation of function. But there must be no conflict of interests, no diversity of dealing with classes in the community, no division of the community into separate jurisdictions, or distribution of sanitary functions through independent departments, otherwise, failure is the inevitable result. As regards the detail of practice in the management of epidemics—isolation, disinfection, the special items of practice adapted to combat the special conditions which promote individual epidemics—there is a tolerably uniform level of attainment of knowledge everywhere. Nay, more. On these matters, it is startling to note how, in the main, the great movements and operations in the battle against infectious disease have been understood and intermittently practised in times of supreme danger, for generations, if not centuries. In the practice we have not much to learn, but in the policy a great deal—in the concentration of the function, in the guidance of the practice, so that there may be uniform and united action over the entire area of what ought to be in reality, as in name, the community. All the weapons of the sanitary armament ought to be stored in one armoury, and wielded under one command.

The first glimpses of the dealings of the authorities of Glasgow with epidemics are obtained in the sixteenth century. The population then averaged 5000, and the Magistrates and Town Council administered the comparatively simple affairs of this small community with but little official assistance. From 1350 they had been provided, by private beneficence, with a Leper Hospital, to which patients were regularly sent by the magistrates; but the plague, which invaded the inhabitants at frequent intervals from a very early date, first tested their capacity for coping with epidemics. In anticipation of its appearance in 1574, the Burgh Court drew up a series of ordinances, which were subsequently revised from time to time, and which were marked by considerable intelligence. Their main substance is a rigid system of quarantine, extending both to persons and goods. Wardens of the ports of the city were appointed for that purpose. Other items in the ordinance were more akin to our modern practice. No lodgers were to be received by any one who had not a "licence" to do so from the magistrates. The duty of immediately reporting cases of sickness was imposed upon all householders, under pain of banishment. "Searchers" were appointed to specified districts, whose business it was to go round their district morning and evening to discover any who might be seized with the disease —an anticipation of the house-to-house visitation of the present day, which I have heard claimed as a practice originated during the first invasions of cholera at the beginning of this century. There was, even at this early date, a foreshadowing of the sweeping operations of our Improvement Trust in the last item of the ordinance:—"Ordains the School-house Wynd and all the Vennals to be simpliciter condemned and steekit up." Nothing is said as to medical aid for the infected, but probably this was not neglected, as, three years after, the Burgh records show that a surgeon was retained for the service of the town, at a yearly salary of ten merks. There are numerous subsequent references to this official, which show that the magistrates always had in their service, at an annual salary, or retained by special fee, a practitioner for attendance upon the sick poor. The ordinary wants of the poor were provided for by the Kirk Sessions, who derived their funds, first from church door collection, and, when these were insufficient, by levying an assessment (1595). The incorporated crafts and the merchants' guild also maintained their poor members, but, down to the eighteenth century, the only provision for medical attendance and medicine for the sick poor seems to have been made by the magistrates from the funds of the Burgh.

In 1646, when the population had almost trebled its numbers, there was another outbreak of the plague, against which more elaborate and advanced measures were adopted by the Town Council. Wooden huts were erected on the Town's Muir at a considerable distance from the town, to which the infected were transported, and where they received medical attendance, and were maintained at the charge of the Burgh funds. A superintendent was appointed, with special instructions to "take notice of the graves." A staff of men was engaged to clean infected houses; they were provided with horses and carts to remove the infected clothing to the muir, there to be "cleanged." A "close cart" was obtained to transport infected filth beyond the bounds; all these measures showing an advance in the understanding of the circumstances which promote the spread of infectious disease, beyond the mere quarantine regulations adopted in former visitations. Rich and poor seem, at the height of the epidemic, to have been isolated and assisted, free of charge, at the cost of the common funds, as, at the end of next year, the bailies determine to exact payment for the services of the "cleangers" from those householders who were in a position to pay. But the point which is of special interest to us at present is this—that all the measures deemed necessary for the suppression of the epidemic were adopted and carried out by the Magistrates and Town Council as representing the community. Councillors were appointed in rotation, whose business it was to visit and inspect the huts on the muir twice or thrice a week, and every Saturday to give in a list of the inmates and of those who had died. Of course, this unity of policy and practice was natural in those simple times, when those fathers of the people personally cared for the infected just as they personally exercised the functions of police, and otherwise governed the citizens very much as a father exercises rule over his own household. Still we have here a principle which we shall see was abandoned in the more complicated circumstances of a larger population, provided with other organisations which were useful and necessary in their own sphere, but which divided the responsibility in reference to epidemic disease—a principle, moreover, which has only in recent times been recognised and again put in practice.

In 1818, Glasgow found itself in the middle of its first great epidemic of typhus fever. It was now a manufacturing city of about 145,000 inhabitants. Of this population, one-half lived beyond the Burgh boundaries, under separate jurisdictions, so that whatever might be the nature of the measures adopted to cope with the epidemic within the jurisdiction of the Burgh magistrates, the territorial unity of the community was destroyed. Beyond those limits they had no administrative authority, and thus one great element of success in dealing with epidemic disease, which existed in the case of the plague, was now impossible of attainment. In other respects the community was more favourably placed. The Royal Infirmary had been opened in 1774 and enlarged in 1816, so that there was now accessible a general hospital with two hundred and thirty beds. But this was the public hospital, not only of the Burgh and more immediate suburbs, but of villages and country parishes for many miles around. Liberal donations towards its erection had been received from the corporate bodies, parochial authorities, and private individuals over an enormous area. Annual subscriptions were contributed from the same sources, so that the managers of the hospital found themselves besieged by fever-patients from all quarters. Within the city, and provided exclusively for the use of the poor of the city, a building called the Town's Hospital had been erected in 1773 at the joint cost of the magistrates, the kirk sessions, the trades' house, and the merchants' house, the bodies upon whom still rested the care of the poor. An assessment was levied upon property by a joint board representing these bodies. This institution was not, however, for the treatment of the sick, but for the reception of permanent poor and the education of orphaned or deserted children. The casual sick were attended at home by district surgeons, or sent to the Royal Infirmary for treatment, at the cost of the corporate bodies mentioned. The immediate result of this arrangement was that the accommodation was, as the epidemic extended, more and more absorbed by cases of fever. From 1795 to 1814, it appears that 13 per cent. of all patients admitted suffered from fever. This proportion rose in the next three years to 40 per cent., and in 1818, at the height of the epidemic, it actually reached 60 per cent.; and this although the managers were compelled for a time to shut their doors. The same tragic drama was now enacted as was witnessed on the occasion of every subsequent epidemic up to quite recent times. A Fever Committee of citizens was appointed, public subscriptions were collected, and, while the epidemic raged and finally burned out, efforts were made to get sites for fever-hospitals, which were thwarted by the opposition of the neighbourhood. The final outcome of these efforts at this time was thirty-two additional beds, obtained by adapting a private residence—a result the practical advantages of which are correctly estimated by the saying of a physician of the day: "It is like extinguishing a conflagration with a single bucket."

It is in one sense humiliating, though in another a legitimate cause of pride, to read the medical pamphlet literature of the day, and recognise the intelligent completeness of the advice tendered at this crisis by the profession in Glasgow to the authorities. It is no exaggeration to say that in these pamphlets may be found a perfect exposition both of the policy and practice which alone can be successful in dealing with epidemics. I do not include in the scope of this paper the routine work of sanitation which would prevent epidemics—enforcement of cleanliness within and without the house, suppression of overcrowding, regulation of lodging-houses, demolition of unhealthy tenements, opening up of densely-populated districts; but all that was pressed upon the attention of the public, and nothing of that was done, until it became apparent, fifty years later, that existence was impossible without such measures. As to the procedures immediately bearing upon the suppression of a present epidemic, the advice given was quite as pointed and perfect. Erect fever-hospitals, in anticipation of future necessity, organise a staff of fumigators or disinfectors; lime-wash the houses; disinfect the clothing; burn the infected and supply new bedding; provide ambulances instead of allowing the public sedan-chairs to be employed to transport fever-patients to the Infirmary; fix the proper number of inmates for the smaller houses, and employ the police to enforce the regulations. Yet even in respect of such a simple measure as disinfection of the houses from which cases of fever had been removed to the Infirmary, we read, six years afterwards, in the annual report of that institution: "Measures have at the same time been taken to have the houses the patients left cleansed and fumigated. The Directors have thus, they hope, done all in their power for staying the contagion." That is to say, the so-called public authorities did nothing but send into this charitable institution the fever which was bred in physical conditions which they ought to have removed, there to be treated at a loss to the funds; and not only so, but they permitted the managers still further to deplete these funds by disinfecting the miserable houses from which their patients were removed.

The injustice and inefficiency of this method of using the charitable organisation of the Infirmary as an instrument for the suppression of epidemics, as a matter of public policy, was amply dwelt upon, both in the reports of the Infirmary and in the medical literature of the day. It was unjust, because the magistrates of Glasgow were absorbing the accommodation and devouring the funds provided by the suburbs and rural districts. The Infirmary was a sort of co-partnery for charitable purposes; and yet a few of the partners were monopolising the whole benefit, or, at any rate, a greatly disproportionate share of it. It was also pointed out that the system of patronage necessarily attached to the method of maintenance by subscription, and the consequent limitation of access to the institution to the channels opened up by subscription, was fatal to the utility of the hospital as an agent in the prevention of fever by isolation. One of the physicians to the Infirmary wrote: "There must be no patronage of individuals; there must be no roundabout application necessary to the magistrates, governors, clergymen, or elders." In short, the only passport must be a certificate of fever from a medical practitioner. That must procure immediate entrance into any fever hospital which is to be of real service to the community. The same gentleman illustrated, with equal force, the absurdity of territorial limitation of the right of admission, when all came from one community. He wrote: "Is fever to be deterred by the barrier of a few Royalty stones, dropped in its passage, though each be regularly numbered, and each have the letter R, as if it were a talismanic character, engraved upon it?" This remark was drawn forth by the resolution of the Glasgow Fever Committee to exclude from their Special Fever Hospital all suburban cases, after having crammed the Infirmary, and so cut off its resources also from the suburbs. Later on, I shall return to the question of policy raised by this proposal. Meanwhile, it is enough to point out that it is impossible to combine two methods of dealing with epidemics—the one by having recourse to the charity of a community, the other by assessment, whether statutory or voluntary, of a section of that community. To attempt this is both to be unjust and inefficient.

We have now obtained a fairly accurate idea of what continued to be the policy and practice of Glasgow in reference to epidemics for well nigh fifty years, the population, meanwhile, increasing *annually* from 2 to 4 per cent. in successive decades, with an influx of Irish, so that their proportion averaged 17 per cent. actually Irish-born. Throughout this period, through all the vicissitudes of trade and popular distress to which a great manufacturing population is exposed, through epidemics of typhus, cholera, relapsing fever, and small-pox, the Royal Infirmary of Glasgow continued to provide hospital accommodation for these diseases, and its managers to perform the unenviable task of extracting the funds necessary for this purpose from the harassed public and the unwilling and stingy authorities, both municipal and parochial, by alternations of coaxing, reasoning, and threatening, as seemed best to suit the immediate circumstances. In 1829, they built a permanent Fever-house, which was enlarged in 1832, and then contained 220 beds. From time to time they erected temporary wooden booths, or "fever-sheds," on their own grounds, or took charge of temporary district hospitals in the city and suburbs, erected either by themselves or by the magistrates. They had even to oppose, at their own cost (and to appeal, happily with success, to the highest courts of law), an application for interdict, raised by the neighbourhood, against the use of one of these hospitals. As may be anticipated, these spasmodic provisions were never made until disease had outrun the accommodation, which was, therefore, never at any time adequate to meet the emergency. In the five years, 1827 to 1832, only one-fourth of the ascertained cases were treated in hospital. Dr. Cowan tells us that, from 1827 to 1840, there were 9665 patients treated *at home* for fever by the district surgeons. Dr. Perry states that in 1843 there were 12,937 cases of relapsing fever attended by the district surgeons, of which only 4½ per cent. were sent to the Infirmary; and still, with a philosophy worthy of Mark Tapley, these gentlemen extract this consolation out of this suicidal policy, that, but for the *liberality* of the Directors of the Town's Hospital in allowing a distribution of money to the sick at home, at least one-third of the 12,397 cases treated at home would have been necessarily sent into the Royal Infirmary at 15s. each, costing £3074 instead of £284, the amount which they distributed! This miserable subsidy of 15s. a piece for the treatment of a case of fever is a fair illustration of the huxtering policy which the Directors of the Infirmary had to encounter in their numerous attempts to extract from the public authorities a charge for the maintenance of the patients with whom they burdened the institution. Year after year they were compelled to urge, under the pressure of their dire necessities, those inconsistent and mutually destructive arguments. To the managers of the Local Poor-Rate and to the magistrates of the Burgh they said :—"You are throwing upon our voluntary subscribers burdens which you ought to bear; you are saving your public funds by consuming our capital, which is derived from legacies and donations, the interest of which was intended to eke out our expenditure for the relief of general sickness." To the public they said :—"A contribution is fairly due from every one, as a *premium*, for the protection and security afforded" (1832). "Our Institution is not merely an Infirmary for the treatment of the diseased poor; it has become *an establishment of Medical Police—a Lazaretto for the seclusion of an infectious disease*" (1833). This inconsistency of argument is another proof of the injustice and inefficiency of endeavouring to treat infectious diseases from private charity instead of from public assessment.

These dismal facts in the experience of Glasgow and other large Scotch towns were not passing unobserved by men capable of extracting a healing medicine from their bitter fruit. Drs. Cowan and Perry in Glasgow, and Alison in Edinburgh, were such, and their names will always deserve honourable mention in the records of a philanthropic and philosophic public policy. Three suggestions of measures of primary importance for the public health and general social wellbeing were derived from the condition of affairs which I have described, and which were urged with the greatest ability and perseverance, by every channel which could reach the intelligence of the public and the legislature, until they ultimately passed into definite enactments.

As Dr. Alison pointed out, "The Statute Law of Scotland *requires* the heritors, ministers and elders of parishes, and the magistrates of boroughs, to make provision for the needful sustentation of all aged poor and impotent persons, to enable them to live unbeggared, and to tax and stint the inhabitants, when necessary, for this purpose" (1840). We have seen that this was done in Glasgow. It was also done in Edinburgh and the chief towns of Scotland; but in the rural districts the law was either neglected, or, for selfish purposes, so administered that "the charities, legal and voluntary, of large towns were burdened by persons from other parts of the country." Dr. Cowan found that, of 178 inmates of the Royal Infirmary, in April, 1840, only 38 were natives of Glasgow, and 98 had not passed the prime of life there. Dr. Perry found that not more than 15 per cent. of the fever patients admitted under his care were natives, and 25 per cent. had not been three years resident; that 30 per cent. were natives of Ireland, and 40 per cent. from the Highlands and agricultural districts of Scotland. In 1840, Dr. Cowan states that "no effective measures have yet been taken to place the indigent poor of the suburbs [of Glasgow] under a system of medical superintendence similar to that within the borough." In 1845, all this was remedied by the passing of the Scottish Poor-Law Act, which gave to Scotland the benefit of an organisation which England had enjoyed since the reign of Queen Elizabeth. This created, for the first time, a class in the community for whose sickness, whether from infectious or ordinary diseases, statutory provision was made and a statutory mission imposed upon a new social organisation to support this provision out of public assessments. As in the case of the charitable aid of the Royal Infirmary, this was, in its time, great blessing to society; but it complicated the development of an adequate public policy in the unification of the management of infectious disease, which is incompatible with the acknowledgment of any class in society, whether pauper or beneficiary.

Another measure was one which had for its object the union, under one municipal government, of the community of Glasgow, which had by its extension become territorially divided under separate and independent local administrations. We have seen that while there were district surgeons within the Burgh, there were none in the suburbs. In 1840, Dr. Cowan sums up the whole position thus :—" Over the city and suburbs there are four independent magistracies and boards of police, four assessments for the poor's rates, and four modes of administering the poor's funds, equally independent of one another." You will remember that in 1818, the impotence of boundary stones to control the movements of fevers in a continuously inhabited area was graphically pointed out. In 1841, the entire community numbered 279,000 inhabitants, of whom 37 per cent. were under three jurisdictions distinct from Glasgow proper. Yet, for Parliamentary purposes, this population had been made one by the Scotch Reform Act of 1832. The enormous social and sanitary disadvantages of this territorial subdivision and antagonism were forcibly and fully pointed out by Mr. Charles Baird in 1841, in a " Report on the Legal Provisions Available in Glasgow for the Removal of Nuisances," made to the English Poor-Law Commissioners, who embraced Scotland in the scope of a Parliamentary inquiry. All these facts resulted in the consolidation of the entire Parliamentary area under one municipal government by the amended Glasgow Police Act of 1846. It contained general sanitary provisions of an important kind, including the regulation of lodging-houses, and the reporting of infectious disease among their inmates, with permissive powers to cleanse and disinfect houses and clothes. It is right to say that these sanitary clauses existed in the Police Act of 1843, and were now only extended in their operation over the entire community. Thus, for the time, another element of confusion in the application of a uniform policy in the management of epidemic diseases was removed, viz., division of jurisdiction in the community; but only for a time. We shall shortly have to point out how, by the progressive growth of the city, the territorial unity was again destroyed, and to state how this difficulty has been circumvented, if not removed, in so far as it affected the control of infectious diseases.

The third, and, in its ultimate issue, the most important measure which was suggested by the difficulties of Glasgow and other towns in coping with epidemic disease was the vesting of responsibility for their entire management in public bodies, having powers of assessment for this purpose, and general jurisdiction over areas determined as far as possible by their natural adaptation to the attainment of the ends in view. This was effected locally by the Glasgow Police Act of 1862, confirmed and amended in 1866, and generally for the whole country by the Scotch Public Health Act of 1867, both of which are to this day the local and general Acts in force in Glasgow and Scotland respectively.

It is necessary to hark back a little, in order to show, in its proper historic relation, the policy of the new Poor-Law organisation in reference to epidemics. Being sectional in the legal obligations which it bore to those attacked by epidemic disease, obviously it would afford only sectional aid in dealing with an epidemic. But parochial boards were empowered by the Act to subscribe from their funds to any public hospital or dispensary, and, therefore, they still looked to the Royal Infirmary for the accommodation of such of their sick as seemed to require hospital treatment. The effects of this policy were soon made apparent. In 1845, typhus was at the lowest ebb ever known in Glasgow. This was but a lull before the storm; and, in 1847, the city was overwhelmed with the most extensive epidemic in its history. In the previous year, more than half the cases admitted to the Infirmary were sent in by the parishes. At its close the accommodation was exhausted. Then followed the usual provision of temporary accommodation at the cost of the Infirmary, and, at last, when the rejected applicants for admission numbered hundreds, the parishes set vigorously to work, and, by the adaptation of the old Town's Hospital wholly for a fever-house, and the erection of wooden sheds, 1024 additional beds were provided, raising the entire number in the city to 1254. By these means, in 1847, no less than 11,425 cases of typhus received hospital accommodation. This was practically all that was done to stay the pestilence. Only when it was dying out was any disinfection of the houses or washing of the bedding attempted. Next year, the Infirmary managers report that the parishes had closed their hospitals, and prevailed upon them to reduce their charge for fever cases from £1 to 15s., a sum, they state, "by no means adequate to cover the average expenditure on each case, but of which, co-operating as they were with the authorities for the public good, they still felt it their duty to accept" (1848).

With similar local assistance, the city encountered subsequent revivals of typhus and epidemics of cholera and small-pox, until, in 1862, the new Glasgow Police Act brought the municipal authorities upon the scene, or, rather, conferred upon them powers which were not exercised, so far as hospital accommodation is concerned, until 1864, when the managers of the Infirmary again found themselves unable to cope with epidemic typhus. They held "numerous conferences" with the Parochial Boards and the Police Board, and wisely stated that "it appeared to them that it lay more properly within the province of the Police Board, under the powers conferred upon the Board by the Glasgow Police Act, to make provision, in times of epidemic, for the treatment of disease" (1864). Thus, by a gentle impulse the municipal authorities were made to enter upon the task of providing hospitals for themselves. But here I must interrupt the current of my narrative to say that Dr. Gairdner was appointed the first Medical Officer of Health possessed by Glasgow early in 1863, and immediately began the herculean task of laying the foundation of the entire sanitary service of the city. As I have already said, it is only the treatment and general management of existing epidemic disease I am at present discussing, but I need scarcely say here that the roots of epidemics can be reached only by an efficient sanitary department, fully organised in all branches of its work. The hard labour, the slow education of public opinion, the reasoning down of opposition, the conciliation of angry interests —all this fell to the lot of Dr. Gairdner, and no one feels more grateful to him than the present writer, whose happy fortune it was to be preceded by such a man, and thus, in a measure, to reap the fruits of his labour. It must, therefore, be remembered in all I have now to say that, contemporary with the various movements in the development of the present policy in regard to epidemic disease, there was very slowly, but still steadily, coming into operation all the departmental work which is essentially necessary to the ultimate success of any policy whatever in that regard.

The 1862 Act was tentative in some of its provisions, especially with reference to dealings with epidemic disease, and showed that the mind of its framers was not clearly made up as to the policy to be pursued. Wisely, therefore, it was provided it should remain in force only for five years. As it happened, during those five years the municipal authorities learned many things. Having been taught all that was known of sanitary practice, its method, and the occasion for its use, under the lash of epidemic disease, it is not surprising that the legislature should have, in such a school, learned a system of spasmodic sanitation. Such was the method of applying Privy Council orders—legal instruments, under the authority of which affrighted authorities proceeded to administer, in drastic doses, that which they ought to have, from day to day, exhibited as a mild tonic to keep the body of the community in constant health. This evil method was introduced into Scotland in the

Nuisance Removal Acts, various editions of which were passed from 1846 to 1856. They conferred no effective powers for ordinary times, no medical officer, and only in extremity of epidemic pressure, by Orders in Council, duly published in the *Gazette*, and for specified devoted localities, brought into operation house-to-house visitation, suppression of overcrowding, special cleansing, power to dispense medicine, and provide medical attendance and hospital accommodation. As was natural, and, indeed, unavoidable, in their first Local Act, the Glasgow authorities followed the general Act, merely instituting a minor grade of treatment by proclamation of "districts, streets, or courts" within the city, advertised in the local newspapers, holding in reserve the Privy Council and the *Gazette* for the direst extremities. These special powers were invoked upon the report of the medical officer "that epidemic, endemic, or contagious disease prevails or exists and threatens to prevail." He was, therefore, placed in the position of a fire-master, who had instructions to watch the progress of a fire until it had assumed, or threatened to assume, the dimensions of a conflagration, at which supreme moment he was required to shout for the fire-engines. Then the fire-engines had to be made, for it was carefully pointed out by the legal advisers of the authorities that they had no power to expend their moneys upon permanent structures. The clauses in the Police Act had strict reference to emergency; and, in fact, their powers must be renewed every six months, with due form of advertisement or proclamation in the *Gazette*. Dr. Gairdner had, in the first place, to choose between the risk of crying "fire," and incurring the ridicule of the public who turned out to see a good blaze and could perceive nothing but smoke (not to speak of the anger of the proprietor, whose property had been unnecessarily made notorious), and the recriminations of the same public if, by misjudged delay, half the city had been wrapt in flames. When the supreme moment did arrive, which was in the winter of 1864-5, he was told that "building of any kind was in that season possible only under great disadvantages, and building of stone or brick absolutely impossible." He, therefore, looked around for a building which might be quickly adapted; and, after many rebuffs, obtained the offer of a large disused mill. No sooner did this project get wind, than a perfect storm of indignant remonstrance gathered in the neighbourhood, burst upon the Medical Officer, and swept his temporary fever hospital at once into the Limbo of vanities. There was nothing for it but to build, and, as every one was now convinced of the necessity of making hospitals a permanent possession of the community, lawyers notwithstanding, a site in the northern quarter of the city was purchased, and, in less than three months, a substantial pavilion hospital, partly brick, partly wood, was erected, furnished, and opened, with one hundred and thirty-six beds, on 25th April, 1865. Premises had been obtained elsewhere for washing and disinfecting clothing in 1864; and a staff for fumigating and lime-washing houses had been organised. While these efforts to acquire hospital accommodation of their own were being made, the municipal authorities had provided for cases in the Parochial and Infirmary fever wards; but they at once discovered that there were many persons attacked who ought, for public safety, to be isolated, but who were not paupers, whom the parishes would not receive, and whom, in fact, it would have been little less than a social outrage to force into the pauper ranks. These were sent to the Infirmary, but could not always be received. Even among those who were brought by fever within the legal definition of a pauper, I found, while in charge of the largest of the parochial hospitals, that only five per cent. had ever before been within the walls of a poor-house. Here, therefore, was a system of pauper manufacture which, for social as well as sanitary reasons, it was of the utmost importance to terminate. When, therefore, the 1862 Act fell to be revised in 1866, the Police Board bound the community to maintain their hospital and washing-house, and took powers to enlarge the same or erect others, as occasion required. The spasmodic system of sanitation was so modified as to permit of the routine use of every known method of preserving health and controlling epidemics in their rudiments. In reference to infectious disease in lodging-houses, the power of compelling removal to the municipal hospital was substituted for that of compelling the Poor Law Inspector to give medical attendance. The general Public Health (Scotland) Act, passed next year, enlarged the power of compulsory removal so as to compass all cases of persons living in circumstances of special individual necessity, or of special public danger; and otherwise, between the Local and the General Acts, the municipal authorities found themselves vested with power to do anything and everything for the prevention and control of infectious disease under their own hand, out of the assessment levied upon the community for sanitary purposes—an assessment which, in the seventeen years during which it has been imposed, has been for eleven years one penny in the pound of rental of houses valued below £10, and twopence in the pound of houses valued at £10 and upwards; for three years, half these rates; for one year, double; for one year a half, and for one a fourth more than those rates.[1]

---

[1] Several paragraphs in the original paper are here omitted. They describe (1) the sanitary establishment of the period which is now much extended, and (2) the

I have still to explain the policy with which this organisation is administered; because, as I have already said, you may have in a community the most perfect organisation, and yet, if it is not worked so as to secure territorial and functional unity in dealing with infectious disease, it will be shorn of half its efficiency. It is curious and instructive, now that we have surmounted all difficulties and disabused ourselves and others of all prejudices and preconceptions, and finally worked out our policy, to look back upon the incidents, sometimes accidents, which have at times co-operated with our design, at times even prevented us from pursuing courses which were inconsistent with it. The disinfecting and cleansing of houses and clothing soon came to be accepted as a duty to be performed by us within the area of the rates, without special charge in any case. So, with reference to domestic servants or other members or dependants of the better classes, we used to exact payment for treatment, but this also was soon abandoned.

We have thus secured unity of policy within the municipal boundary; but what about our territorial unity? We have seen how, at the end of last century and the beginning of this, our territorial unity was destroyed by the outgrowth of the population and the development of separate jurisdictions, and how it was restored in 1846 by the amalgamation of those jurisdictions into one municipality. Since that date, Glasgow has continued to overflow her boundaries until, at the census cf last year, the community was found to number 681,000 persons, of whom 25 per cent. are under the jurisdiction of no less than nine independent Burghs, which have from time to time been constituted during the last thirty years. This is a fact of serious importance in a community which is essentially one; and that it is a growing evil will be apparent when I state that during the last ten years, while Glasgow added only 4 per cent. to its population, the suburbs added 19 per cent. I shall not enter into any discussion of the general disadvantages attending this condition of territorial subdivision and antagonism, but confine myself to its relations to the subject in hand. The sanitary disadvantages are no doubt the greatest. At many points of the municipal boundary, there is no natural division whatever between us and our neighbours. Houses are cut in two, streets are cut across, and everywhere you pass by a step into another jurisdiction. In my experience, epidemics never cover the whole area of the community at their first incidence. They begin in one district, and if not checked, eat their way through the mass, while if they are vigorously attacked they

history of the negotiations with the Parochial Boards and General Hospitals regarding the provision of accommodation for the treatment of infectious diseases which have been already treated in a previous section of this chapter.—[Ed.].

may be stamped out in that district. If they begin within the municipal limits, the whole repressive force of the municipality is directed upon the spot. If they begin outside those limits, the appliances of the petty Burgh, even at their best, cannot command adequate resources; and we can only stand by to quench such sparks as may be projected into our premises. Still, as regards infectious disease, we have been able to exercise a wholesome influence not only upon our immediate neighbours, but upon the rural authorities for many miles around. The Public Health (Scotland) Act enables the Board of Supervision (the Central Board of Control in Scotch health matters) to compel all local authorities to appoint a Medical Officer and Sanitary Inspector, and whenever we found our interests at stake, and that those officials did not exist, we have directed the attention of the Board to the fact, and procured their appointment. As regards hospital accommodation, the Royal Infirmary was the key of the position. Upon it, as we have seen, not only Glasgow, but the suburban and rural authorities for miles around, depended for fever accommodation. So soon, therefore, as we had provided for ourselves, we set to work to compel all those local authorities to erect hospitals of their own, under the permissive powers of the Public Health Act. The first effect of drafting infectious disease from the wards of the Infirmary to our own was to place more ample accommodation at the disposal of those authorities, or of subscribers living within their jurisdiction. The result of this in the case of small-pox was especially aggravating. It spread in the wards of the Infirmary and infected the city. The recognition of this fact speedily led, as we have seen, to its total exclusion. Before the managers adopted the same course with regard to fever, the proportion of the total cases received into the Infirmary from beyond the municipal bounds, through subscribers and local authorities, had risen, from year to year, until in 1876 it reached 16 per cent. from the immediate suburbs, and no less than 44 per cent. from the surrounding country. Having finally got into our own hands all the hospital accommodation for infectious disease in the city, it is obvious that in such circumstances we had a very important part to play. We were beset with applications for assistance from authorities and private parties. To the former we said—we shall afford it at a certain rate of charge, provided you undertake immediately to procure hospitals of your own. The latter, we for several years accommodated by private agreement; but we soon found that the local authorities under whom these persons lived were circumventing us in this way. We, therefore, resolved to refer all private applicants to their own authority, with whom alone we would deal. We acted in the same way with requests for the assistance of our disinfecting staff and our washing establishment. Some difficulty was experienced in the case of certain local institutions, such as Reformatories and the Deaf and Dumb Asylum. Their managers argued that they were Glasgow institutions, and this argument was for some time listened to by our authority. Now, however, we refer them all to the authority within whose bounds they stand. So with two of our Poor-houses. In their case the argument was : They are mostly Glasgow paupers, and our parishes, though they extend landward beyond the municipal bounds, are assessed uniformly, and you are robbing Peter to pay Paul if you refuse us or even make us pay as highly as mere foreigners. But we replied : The case is not so. You are the local authority for such parts of your parish as are not burghal. We treat your paupers free of charge so far as your parish lies within our Burgh. Apply to the other Burghs for similar offices ; and where you yourself are the local authority, you have distinct powers of assessment as such over that area, and ought to debit yourself in that capacity. As to paupers in your poor-house, as persons suffering from infectious disease, they are chargeable in the place where they presently lie, not to that from which they have been removed. The aggregate result of all these negotiations has been that two suburban hospitals have been erected by the combination of five of the neighbouring Burghs ; that the remaining four send their cases to us at a charge of £8 each ; that one of our parishes sends its landward paupers to these hospitals and the other to us at the same charge ; that several hospitals have been erected in rural districts ; and that in general, when a case of infectious disease occurs, everybody knows where to look for immediate assistance. If a case is found within our bounds, whether resident or peripatetic, we take it at once ; if an application is made regarding a person living outside, we refer it to the proper authority, certain that it will be immediately cared for, or, at any rate, that the responsibility is formally brought home to the responsible authority.

Allow me now to give some brief details of the practice which is pursued upon these principles. We have no local system of compulsory reporting of infectious disease. We have long felt this to be a serious defect, but we would prefer that some such system should be instituted by imperial legislation for the whole country. We have always cultivated the friendship of the medical profession, and have been fortunate in securing it hitherto. Although we entertain strong opinions as to compulsory reporting, we choose to avoid, if possible, that local irritation which is so apt to attend its local adoption. The sources of our information at present are: the registers of deaths, transcripts of which are obtained weekly by payment of three halfpence for each entry, but which are also open to the daily scrutiny of our inspectors; the voluntary reporting of practitioners, who are all furnished with printed forms and stamped and addressed envelopes for their transmission; the School Board officers, who also are provided with forms; the private information of neighbours and others. But 49 per cent. of all the cases known to the department are discovered by house-to-house visitation. Whenever a case has come to our knowledge through any channel, every house in the immediate vicinity is visited, and all houses known to be infected are kept under daily surveillance until a fortnight has elapsed since the occurrence of the last case. If, in the course of his visitation, an inspector finds a person ill, the nature of the disease not being apparent or being denied, and especially if no practitioner is in attendance, he is provided with a book of blank orders, one of which he fills up, and delivers to the householder, or directly to some medical man, by preference to the district parochial surgeon, requesting him to visit and sign the attached certificate. For this service, a fee of half-a-crown, which covers any number of cases found in one family at one time, is paid by the Town Council. In any case where removal to hospital is thought to be necessary, and no opposition is offered, the inspector goes to the nearest district police station. These are all in telegraphic communication with the sanitary office. He transmits the requisite message, and from thence the order for the ambulance is wired to the hospital to which the patient is to be removed.

In the evening, the epidemic inspector returns to the office with the particulars of each case, entered in due form in his memorandum-book, with the measures adopted. These are submitted individually to the Medical Officer, who sees at a glance the sanitary facts, consults and advises as to special features, and makes a short private note of the cases, so as to keep the leading points in continuous relation clearly before his mind from day to day. Before leaving the office, each inspector adopts the measures requisite to have the routine procedures, and any special instructions, carried out. He orders washing of clothes and disinfection of houses: communicates instances of overcrowding, or of nuisance noted, to the proper officers; directs removal to the reception-house of any infected families to whom it has been thought necessary to offer such accommodation for a fourteen days' quarantine, and who have agreed to accept it; and fills in School Board notices. These have for their object (1) the intimation to teachers and to the Board of the existence of infectious disease in families from which children are attending school; (2) intimation that families previously reported are now free of infection. The washing of clothing and the disinfection and lime-washing or size-colouring of houses is deemed to be of supreme importance. The filthiness of the bedding and clothing of the lower orders of Glasgow is simply indescribable. This, taken in connection with facts established regarding the inherent vitality of the contagia, leads us to regard these articles as perennial sources of disease. The germs of infection acquired from one outbreak are stored up from year to year, perpetually springing into renewed activity in the persons of the susceptible, acquiring epidemic virulence under general intermittent conditions which are little understood, and thus perpetually restored; so that, unless the stock is cut short by a thorough washing, there comes no natural end to their lineal propagation. Our experience gives us confidence in the disinfecting efficiency of thorough washing, with boiling, by the injection of steam, without the use of any substance or process commonly called disinfecting, where such washing is applicable. All our washing is carried out in common in one establishment (which has for some time not been commodious enough, but which we are about to rebuild on a much larger scale), and yet we have never known a single instance even of suspicion of the introduction of a new disease into any house, or of the revival of the old. Against old mattresses and pillows we wage perpetual war. Fortunately, the materials chiefly used in Scotland by the working classes are such that they can be burned and replaced at small cost. They are mostly straw and chaff, or wool-flock of a very inferior quality. For all these reasons it has come to be recognised as a standing order of the department, wherever a dirty house is associated with *any form of infectious disease* which can be made a legal excuse for the expenditure of the rates in such operations, to seize that excuse and start the inmates afresh in life with a thorough purification.

There are some special points in the management of individual epidemic diseases which merit a short reference. There is Small-pox, of which you have considerable experience in London. The prime point of preventive practice is, of course, vaccination. By one of those unfortunate divisions of responsibility, which are inevitable in the course of piece-meal legislation, before the vision is enlarged so as to take in the whole horizon of the object which ought to be in view; the practical enforcement of the Scotch Vaccination Act is entrusted to the Parochial Boards. I early learned that it is impossible to induce persons to submit to re-vaccination except in presence of small-pox; but it has always been a standing order to the sanitary staff to be on the outlook for those who had escaped primary vaccination, with whom we could deal not wholly by favour or persuasion on the ground of personal advantage. In 1875, I discovered that fully 3 per cent. of all the children born in Glasgow were returned as unvaccinated; so that in seven years we had produced between four and five thousand who, so far as known, were unprotected—a fact of serious importance, not only for us but for the country at large. I found, on investigation, that while all the statutory forms were duly observed by the Inspectors of Poor, there was no special effort, certainly no thorough method of personal search, instituted for the discovery of defaulters. I therefore made a private arrangement with the inspector of our largest parish, in which the work seemed to receive most attention, to have transmitted to me monthly a list of the children who had been reported by the registrars, and of whom the parochial officials had been satisfied they could find no trace. I distributed those names among the district sanitary inspectors, with this result: that they successfully followed up and found fully 26 per cent. of those children. The majority were found to have been already vaccinated, although the certificate had not been lodged; but 6 per cent. of those reported to me, and who were found, had not been vaccinated. This gratifying result induced me to ask the Town Council to authorise me to make this a permanent branch of our work, and so, by voluntary effort, to remedy the division of responsibility created by law. The permission asked was at once granted; and we now obtain weekly transcripts of the vaccination register from the registrars. The natural unity of this service with general sanitary work, is demonstrated by the fact that we overtake it without adding a single man to our staff. There is no such thing in Scotland, to the credit of our national intelligence, as an organised obstruction to the operations of the Vaccination Act. Among the defaulters, I have only encountered two persons in six years who had objections to the use of humanised lymph; and for these I at once obtained vaccine lymph, as I am prepared to do in any case where that will remove any difficulty. The defaulters belong, with hardly an exception, to that class of the population who are negligent of all duties, whether legal or moral, who are vicious, irregular, ignorant, or, at the least, thoughtless and unfortunate; 26 per cent. of the children involved were illegitimate. It is among that class our staff is constantly moving, and with them they are in constant relation, so that, in the course of their ordinary house-to-house visits, they take up this with their other duties.

As to re-vaccination, as already stated, it is no use endeavouring to persuade the poor to be rational, and submit to this operation as a routine practice, in anticipation of risks which they cannot discover. In presence of small-pox they will submit, but only if the operation can be effected at once. At first we acted in this way. On visiting, for the first time, a case of small-pox, the inspector was instructed to examine all those in the house and neighbourhood, and secure the names of those who seemed to require protection. A medical man was then sent to the locality with this list; but our invariable experience was that, in the interval, there had been a general laying of heads together, and consequent consolidation of all prejudices and old wives' fables, so that scarcely anybody would submit. Here was a practical difficulty to be overcome; and the common-sense view of the dangers to be avoided was this. Provided the lymph is carefully selected by a competent medical vaccinator, any intelligent layman instructed by this vaccinator is as well able to perform the mere operation of re-vaccination, and to judge, according to easily defined rules, on whom it ought to be performed, as any medical man can be. Therefore, I had each epidemic officer put through a short course of instruction in the operation. We have always had a station for primary vaccination, managed by a medical vaccinator. He selected the lymph and was responsible for its purity. Tubes were charged by him, and each collection numbered, so that its origin and its pedigree were known. The inspectors always carried a stock of this lymph about with them. Whenever one of them went into an infected house, he said, "Now, you know, you must all be re-vaccinated." Arms were bared and the thing was done before they had time to think about it. I do not mean to say that no recalcitrants were encountered, but I do say that a degree of success was obtained in this way which would not have been possible in any other way. Where the parties had a private medical attendant, the inspector advised them to go to him, told the doctor of the circumstances, gave him lymph if he required it, and did not lose sight of the family until the operation was done. Primary vaccinations were not done by the inspectors, but a note was made of unprotected children, and the mothers either took them to the station or the medical vaccinator went to them. As to cases of small-pox, we enforced removal to hospital with much more sternness than in the case of any other infectious disease. We had no hesitation in applying for magisterial warrants when persuasion failed, but after executing one in a locality it was seldom necessary again to appeal to force. In the ten years 1871-80, we performed 12,718 primary, and 9,614 secondary vaccinations. I believe the latter are understated, as under pressure the men were more careful to get as many protected as possible than to record their cases. The practical result may be summed up thus. Small-pox was epidemic during the four years 1871-2-3-4, during which time 4,328 cases were known to exist, of which 74 per cent. were treated in hospital, and 8,730 re-vaccinations were recorded as done by our own staff, or an average of fully two persons for each case. The total deaths in three years numbered 786, of which 67 per cent. occurred in hospital. The death-rate was never higher than 4.3 per 10,000 of our population, and averaged 3.8.

Typhus.—Overcrowding of inmates in dwelling-houses, with the personal filthiness which almost invariably accompanies overcrowding, are especially favourable to the development of epidemic typhus. Thirty per cent. of the dwellings in Glasgow consist of only single apartments, 44 per cent. of two, and 15 per cent. of three apartments. There are special clauses in our local Police Act enabling us to measure the cubic contents of all such dwellings, and to affix upon them a ticket stating the number of inmates allowed, on the very moderate scale of 300 cubic feet for each adult, two children under eight being reckoned as one. We propose to raise this standard to 400 cubic feet in our new Police Act. This ticketing is accompanied with the right of night-inspection, for the purpose of counting the inmates; overcrowding subjecting the householder to a penalty. We regard the constant exercise of this right of supervision as our main protection against typhus. At first it was carried out by the police, but in that and other respects we soon cut our connection with the police. Night after night, all the year round, our inspectors are out in some part of the city. Their inspections have averaged over 41,000 a year for the last ten years, in only 4 per cent. of which was overcrowding discovered. In 1856, when typhus was epidemic, Dr. Gairdner found that 8 per cent. of the houses visited were overcrowded, and that the epidemic incidence varied in different districts almost in exact proportion to the overcrowding discovered. Previous to 1873, typhus was not distinguished in the registers of deaths from other "fevers," so that I cannot contrast its fatality over the same periods as that of small-pox. But in the five years, 1876-80, there were only 258 deaths from typhus, or a death-rate of barely 1 per 10,000 of the population (.99 exactly). In 1881 it was only .82 per 10,000. The deaths ascribed to "fever" in those years of epidemic prevalence, to which reference has been made in the course of this paper, were undoubtedly almost entirely caused by typhus; but, to make the comparison quite unimpeachable, I may state that in 1871, the death-rate from all "fevers" was 16 per 10,000; that it has fallen year by year, with only one slight break in 1880, caused by an epidemic of enteric fever, introduced through the medium of milk sent in from a farm twenty miles distant, and that in 1881 it was only 4¼ (4.34) per 10,000. In the ten years, 1871-80, we have a mean death-rate of only 7 per 10,000, against a mean of 20¼ (20.24) in the ten years immediately preceding. In the great epidemic of 1837, it was estimated that the death-rate was 86 per 10,000 from "fever," and in the five years, 1837-41, it maintained a mean of no less than 44½. In the last ten years, we have treated in our hospitals 3,378 cases of typhus; while in 1837, the city having only half its present population, and the cases isolated forming only a moiety of those which existed, there were 5,387 cases treated in the Infirmary.

The infectious diseases which chiefly affect children form a large and very fatal class, which, amid all the advances of modern sanitation, still rival in their epidemic outbursts those infectious diseases of adults whose periodic ravages have almost become events of the past. The great obstacle in their preventive treatment is the fact that they do affect children chiefly. The feelings of the parents will always stand in the way of isolation. I believe, however, that our systematic application of washing and disinfection of the houses has been eminently beneficial, removing from the household those perennial sources of infection revived in the persons of successive susceptible generations of children. We have also endeavoured gently and persistently to familiarise parents with hospital treatment. The admission of mothers along with children of tender years has been a great inducement. Very frequently, after remaining a few days, they acquire confidence in the management of the nurses, and leave the patients voluntarily to their care. The benefit to be derived from isolation varies in the different diseases. In scarlet fever it is at its maximum. During the dangerous period of convalescence a control is exercised which is impossible at the hands of parents, except in rare circumstances. We find that an average residence of about eight weeks is requisite; but with every precaution, there is no contagium which is so adhesive, and so apt to linger in unexpected corners of the person and clothing, as that of scarlet fever. We find that the dismission of patients is very difficult to arrange, so as to clearly cut off the infection and leave it behind. Parents send in clothing, or the disinfected clothing is got out of store. They promise to call on a certain day at a certain hour, and the child is dressed in anticipation. They do not come, and then mischief is very likely to ensue. We are endeavouring to overcome these difficulties by something which might be called a convalescent clearing-house, but it is not easy to cover all eventualities even then. Hospital treatment of measles is of minimum use, except as saving life by the superior care and medical skill bestowed upon the patien admitted. The infection is scattered abroad before the is removed. Therefore, we pay especial attention to the exclusion from schools of children who belong to infected families. Whooping-cough occupies much the same position. It is an interminable disease, tapering off at both ends into a condition not recognisable except by relation to the condition which supervenes or precedes. The child is on the whole vigorous, except in the youngest cases. I believe, therefore, that the benefit of treatment to the individual case is almost all that can be claimed for the hospital treatment of whooping-cough. In Glasgow, where pulmonary diseases are so rife and so fatal, it is a fearful scourge. In 1872, it caused a death-rate of 21 per 10,000 of the entire population. In 1874, scarlet fever produced a death-rate of 33 per 10,000, and measles, in 1871, of 18. Still, contrasting the ten years, 1861-70, with the ten years, 1871-80, we find in all these diseases substantial evidence of improvement—in the case of scarlet fever, a fall from a death-rate of 13 per 10,000 to one of 10; in measles, from 8 to 7; in whooping-cough, from 15 to 12½.

I wish, in conclusion, merely to point out that during the ten years to which I have appealed for the results of the policy and practice of Glasgow in the management of epidemic disease, both the policy and the practice were only being matured and developed; more especially, the policy did not reach its full proportions until the last years of the decade. I think, therefore, it is pretty safe to anticipate that whoever may sum up the results of the ten years which now lie immediately in the future of Glasgow will have some facts to put in evidence which will tell still more strongly and decidedly in favour of the policy and practice which I have ventured to bring before the Epidemiological Society of London.

CHAPTER V.

THE IMMEDIATE RESULTS OF DISPLACEMENTS FROM INSANITARY DWELLINGS.

THE OPERATIONS OF THE CITY IMPROVEMENT TRUST.

We have already seen (p. 57) that the area originally scheduled under the Improvement Act extended to 88 acres, which were situated chiefly in the Central District of the City, but also in Gorbals and Calton. The inhabitants of these areas numbered over 51,000 persons, and between 1870-77 extensive clearances were effected. In May, 1874 and 1875, and again in 1877, an investigation was conducted regarding the rehousing of 2270 families, comprising 5870 persons, and the conditions before and after displacement compared with regard to size of house and number of occupants, rental, and sanitary conveniences.

The situation of both, with reference to the centre of displacement, is also shown, and in the corresponding enquiry of 1877 the analysis was extended to include the effect of displacement on the individual members of households with regard to place of employment.

Details of the first and second displacements were submitted to the Philosophical Society of Glasgow, and are now reproduced together with extracts from the third Report, which refers to the displacement of 1877.

As a general result, these enquiries showed that the crest of the outward wave of displacement was reached about three-quarters of a mile from the centre, and that the majority of the displaced families went into houses better adapted to their numerical requirments. The rents increased, but so also did the accommodation supplied.

In an address, as President of the Section of Public Medicine, at the annual meeting of the British Medical Association at Sheffield, 1876, the combined results of the first two displacements were summarised, and occasion was then taken to consider the question of providing buildings for the dishoused—together with the hygienics of flatted tenements and model dwellings. This leads to a discussion of density in relation to health. The papers are here reproduced in the order just indicated.—(Ed.)

(1) *On the Immediate results of the Operations of the Glasgow Improvement Trust at May, 1874, as Regards the Inhabitants Displaced, with Remarks on the question of Preventing the Recurrence of the Evils which the Trust seeks to Remedy.*[1]

The results which the Glasgow City Improvement Trust desires to attain by its proceedings are clearly set forth in the Preamble of the Act, by which that Trust was constituted, in these terms:—

"Whereas various portions of the City of Glasgow are so built, and the buildings thereon are so densely inhabited as to be highly injurious to the moral and physical welfare of the inhabitants, and many of the thoroughfares are narrow, circuitous, and inconvenient, and it would be of public and local advantage if various houses and buildings were taken down, and those portions of the said City reconstituted, and new streets were constructed in and through various parts of said City," &c.

The first part of this preamble is that with which this paper is chiefly concerned. The Trust obtained power to turn out the inhabitants of certain buildings, with the intention of improving their "moral and physical welfare," in so far as it was injured by those buildings or houses. No one will expect a simple transference from one house to another to produce an effect which can be fully estimated, whether it be good or bad, at the very time of the transference. Moral and physical injury grows into the moral and physical constitution of the individual in the course of his life, and is cumulative in the constitution of successive generations of his descendants. A gutter-child from the Bridgegate is a very complicated production. More forces have contributed to the pitiable result than those which have operated within the short span of his own life, or even passed into his body from the parents who begot him. The evil which the Improvement Trust sets itself to remedy was worked in successive generations, and the good which it desires to effect cannot be exhausted in a period short of the life of one generation, if not of several.

---

[1] Read before the Sanitary Section of the Philosophical Society of Glasgow, 14th December, 1874.

I make those prefatory remarks, and wish in the title of my paper to emphasize the adjective "immediate" in order to indicate the only part of the "results" of the proceedings of the Improvement Trust regarding which I intend to contribute a little precise information, and in order to prevent you from estimating the value and scope of my paper, either in excess or in defect of its real importance. What I mean by "immediate results" is nothing vague or speculative, nothing sensational or sentimental, but simply such exact facts as are capable of numerical statement—viz. the size, monthly rental, number of inmates per house, distance of the house from the centre of the city, and manner of the excrement disposal of the inhabitants, before the proceedings of the Improvement Trust at last May Term and after.

Since 1870 the Improvement Trust has, from time to time, demolished the houses of some 15,425 persons. At last May Term some 351 houses were pulled down. The districts operated upon were St. Andrew's Square, Calton, and Main Street, Gorbals. Although 351 families were thus expelled, I propose, partly from necessity and partly from choice, for the sake of purity of results, to confine my data, as to size, rent, and inmates, to 243 houses. The remaining 108 are accounted for thus:—In many cases we failed to trace the subsequent residences from not catching the families before they removed. In other cases, from the combination of dwelling-houses with shops, the rental and general character of the occupancy were such as to remove them from the category to which the great majority of the houses belonged; while in the case of a large new tenement in Great Hamilton Street, which was involved in the operations necessary for the formation of a new street, the houses were really of a superior kind, and would not have been interfered with but for this accident of position. A similar remark applies to some of the houses in St. Andrew's Square. Having excluded those houses, the remaining 243 are on the whole fair samples of the utterly insanitary house, and their 990 inhabitants, fair specimens of the miserable population whose "moral and physical welfare" are alleged in the Preamble of the Improvement Act to be injured by the houses which they inhabited.

The three areas operated upon present some differences, more particularly as to the rental of the houses demolished, which is highest in the Central District, lowest in the Southern District, and intermediate in the Eastern District. Still, the facts regarding these demolitions may best be considered in the aggregate.

1st. *Size of House.—Before* the operations, of the 243 families whose subsequent history has been traced, 118 lived in houses of one apartment, 96 in houses of two apartments, 23 in houses of three apartments, and 6 in houses of four apartments. *After* the operations those 243 families were housed as follows—viz. 96 in houses of one apartment, 116 in houses of two apartments, 16 in houses of three apartments, and 3 in houses of four apartments, this accounts for 231 families. The remaining 12 were distributed thus :—5 to the suburbs, 2 to the country, 3 to lodgings, and 2 to Ireland. For the sake of comparison these whole numbers may be reduced to percentages, when we find that *before* the intervention of the Improvement Trust, 48½ per cent. of the families lived in houses of one apartment, *after* 39½ per cent. ; that *before* 39½ per cent. of the families lived in houses of two apartments, *after* 48½ per cent. ; that *before* 9½ per cent. lived in houses of three apartments, *after* 6½ per cent. ; that *before* 2½ per cent. lived in houses of four apartments, *after* 1 per cent. ; leaving 5 per cent. who *after* these operations settled in the suburbs, lodgings, or removed to the country districts of Scotland or to Ireland. The same facts may be stated in another way, thus :—Of 118 families living in houses of one apartment, when expelled by the Improvement Trust, 76 removed to houses of the same size, 39 to larger houses, 2 to lodgings, and 1 to the country in Scotland ; of 96 families living in houses of two apartments, 66 removed to houses of the same size, 10 to larger houses, 17 to smaller houses, 1 to the country, and 2 to Ireland ; of 23 families living in houses of three apartments, 4 removed to houses of the same size, 18 to smaller houses, and 1 to lodgings ; of 6 families living in houses of four apartments all removed to smaller houses.

2nd. *Rental of House.*—The monthly rental was ascertained in each case, both of the house which was left and the house to be occupied. The average rental, according to the number of apartments, has been calculated in both cases. It is evident that some differences existed in the value of the property demolished in the different districts of the city. It seems to have been lowest in the Gorbals, and highest in St. Andrew's Square area ; thus in Gorbals, the average monthly rental of one apartment in the property demolished was 6s. 3¼d. ; in Calton, 6s. 7½d. ; and in St. Andrew's Square, 8s. 7½d. In Gorbals the average monthly rental of two apartments was 8s. 10¼d. ; in Calton, 10s. 1½d. ; and in St. Andrew's Square, 10s. 3½d. Throwing all these districts together, and calculating the average rental paid for each size of house by the families ejected, in the houses abandoned, and in the houses into which they removed, we find it stands thus :—In the *old* buildings, a house of one apartment cost on an average 6s. 7¾d. per month; in the *new*, 7s. 11½d. per month. In the *old* buildings, a house of two apartments cost on an average 9s. 7¼d. per month; in the *new* 11s. 6¼d. In the *old* buildings, a house of three apartments cost 11s. 5¾d. per month; in the *new* 18s. 1½d. In the *old* buildings, a house of four apartments cost 13s. 4¼d. per month; in the *new* 17s. 2d. In all cases, therefore, the operations of the Improvement Trust brought an increased expenditure in the shape of rental to the families involved. Stated as a percentage upon their former rent, this increase amounted to 20 per cent. on the rental of a house of one apartment, to 20 per cent. on a house of two apartments, to 58 per cent. on a house of three apartments, and to 28 per cent. on a house of four apartments.

I must pause here to make a few remarks on these comparisons between the sizes and rental of the houses demolished, and the houses into which the families occupying them removed. The number of apartments in the houses demolished is for the most part an entirely delusive method of estimating the accommodation afforded, whether calculated according to the cubic space of those apartments, or as to the sufficiency of the structure; but especially as to the cubic space. To speak of three or four apartments in the old houses is generally a mere fiction, and a fiction of a very tragic kind. Thus, what could a house of one apartment be at 2s. 6d. or 3s. 6d. per month, or a house of two apartments at 5s. per month, or a house of three apartments at 5s. 10d. per month, or a house of four apartments at 7s. 10d. or 8s. 6d. per month? Yet these are all actual quotations of rents paid for such houses in the property lately demolished. It is therefore evident that a very great part of the contrast between the average rental of the old and new houses especially of those of three or four apartments, arises from the fictitious nature of the accommodation afforded by the old houses. The case of a tenant paying more rent in those circumstances is precisely that of one who ceases to buy a cheap but bad and adulterated article, and buys instead a more expensive but good and pure article.

3rd. *Number of Inmates in House.*—Overcrowding of individuals in the family is more serious than overcrowding of families on the soil; hence it is important to ascertain whether the number of inmates per house was greater before or after the operations as regards the families involved. This is all the more important owing to the great increase in house rent, which we have just seen was an immediate result of the change to the families displaced. I find, then, that in the *old* houses of one apartment the average number of inmates was 3.6, and in the *new* houses of one apartment 3.3; in the *old* houses of two apartments the average number of inmates was 4.6; in the *new* houses of two apartments also 4.6; in the *old* houses of three apartments 4.3; in the *new* houses of three apartments 4.9; in the *old* houses of four apartments 3.6; and in the *new* houses of four apartments 6.3. Still further reducing the comparison to the number of inmates per apartment in the old and new houses, I find that in the *old* houses 990 individuals were accommodated in 403 apartments, giving an average of 2.4 inmates for each apartment, and that in the *new* houses 949 individuals were accommodated in 388 apartments, giving still the same average of 2.4 inmates for each apartment. Returning to my remark as to the fictitious nature of the old house accommodation, it is quite certain that the same number of inmates per house or apartment in the old and new houses really means an increased cubic space in the new houses—this is especially true of the houses of three and four apartments. In the old houses these apartments are merely nominal, in the new they are real.

4th. *Distance from the Centre of the City.*—The operations of the Improvement Trust at last May Term were confined to three areas—the Calton, St. Andrew's Square, and Gorbals. The Cross may be taken as the centre of the city, as almost equi-distant from all points of the circumference, and certainly as the nucleus round which the city has grown—the oldest part of it, and the most densely inhabited and most unhealthy. Taking the Cross, therefore, as the centre, I have determined the relative distance, before and after those operations of the Trust of the houses occupied by 263 families displaced, by marking their position on a map in relation to circles described, with a radius increasing by quarters of a mile in distance from this centre. *In their original habitations*, of these 263 families, 29 were within a quarter of a mile of the Cross, 162 within half a mile, and 72 within three-quarters of a mile. *In their new habitations*, 26 were within a quarter of a mile of the Cross, 79 within half a mile, 108 within three-quarters of a mile, 29 within one mile, 13 within one mile and a quarter, 3 within one mile and a half, and 5 beyond the municipal boundaries. Reducing these numbers to percentages of the whole number of families displaced, we get this comparative result: In their original habitations 11 per cent., in their new 10 per cent. were within a quarter of a mile of the Cross; in their original habitations 62 per cent., in their new 30 per cent. were within half a mile of the Cross; in their original 27 per cent., in their new habitations 41 per cent. were within three-quarters of a mile of the Cross; in their original, within one mile of the Cross, none; in their new habitations, 11 per cent.; in their original within a mile and a quarter of the Cross, none;

in their new habitations 5 per cent., in their original within one mile and a half of the Cross, none; in their new habitations, 1 per cent.; in their original, beyond the municipal bounds, none; in their new habitations, 2 per cent. The change may be summed up in the statement, that *before* these operations only 27 per cent. of the families displaced lived beyond half a mile from the Cross; but that *afterwards* in their new houses, no less than 60 per cent. found themselves beyond that distance. Or taking a wider circle as the limit, none of the families were over three-quarters of a mile from the centre of the city in their original homes, but now 19 per cent. are outside that circle.

5th. The only remaining point in the immediate change in the circumstances of the families evicted which can be exhibited in this form, is *the method of excrement disposal.* Including for this purpose also the total 263 families whose future residence was traced, I find that only 12 of these had water-closet accommodation originally, but 35 have such accommodation in their new houses—that is, whereas only 4½ per cent. of the families whose houses were demolished sent their excreta into the sewers before the demolitions, nearly 13½ per cent. did so afterwards.

This indicates a very decided tendency to increase the proportion of the total excreta of the population which is sent into the sewers and so to add to the pollution of the Clyde at a rate increasing beyond the mere increase of the population. As to the immediate effects of the change from privies and ashpits, as the method of excrement disposal, upon the families themselves, two things must be taken into consideration: *First*, That from the close occupation of the ground in the old localities, for the most part no site was to be had where a privy or midden could be placed so as not to be a nuisance, and even a source of injury to the health of the inhabitants. *Second*, That of the 35 families who found themselves supplied with water-closets after these operations, only 13 found them in their houses. The remaining 22 found them on the stair. The change from a midden reeking in a confined court, possibly right under your window, or at the foot of the stair, to a water-closet on a stair well ventilated and cleanly kept, must be admitted to be for the better.

On the whole, then, the result of the intervention of the Improvement Trust, as regards those families, has been at once to cause their redistribution into houses better suited to their requirements as to size, and situated much farther from the centre of the city, to compel them to incur some 20 per cent. more expenditure for rental on one and two apartment houses, and considerably more for houses above that size, and in some cases to improve the method of their excrement disposal.[1]

I have now placed before you all that seems to me to be involved in the title of my paper; but as a supplement, you will allow me to add a few general remarks on the condition necessary to ensure the success of the Improvement Act, and particularly on the prevention of the return of the evils it is intended to remove.

When a scientific surgeon has removed a tumour from the human body his first impulse is to submit it to microscopic examination, and to determine from the results of this examination what is its exact nature, and above all whether it has a tendency to recur. In like manner, no physician worthy of the name is satisfied with simply treating his patient, or even curing the disease. He also inquires into the origin of the disease, observes its habits and characteristics, and, if possible, gives such advice as will prevent its recurrence. The ailment of which the Improvement Trust desires to relieve us is a very serious one, and the cure of it very costly, and with this, as with our own personal diseases, prevention is not only better but cheaper than cure. I propose, therefore, to glance at the nature, history, and mode of prevention of the civic disease against which the operations of the Improvement Trust are directed.

The disease is overcrowding of various kinds—

1. Overcrowding of tenements on the soil, or over-building.

2. Overcrowding of dwelling-houses in the tenement, and internal defects of structure.

3. Overcrowding of inhabitants in the dwelling-house, or overcrowding proper.

Each of these three forms of overcrowding is an evil in itself, and may exist independently of the other; but, in fact, they are cognate, and are generally found together, each intensifying the evil effects of the other, and all together producing that state of chronic ill-health, with acute exacerbations, which is a feature of the life of Glasgow. Let us run rapidly over each form separately, touching on these three points,—the injury which each causes, especially to the "*physical* welfare" of the inhabitants, the natural history of each (which will guide us to the prevention of each), and lastly, how far we have succeeded in adopting the measures necessary for prevention.

---

[1] I wish to avoid stating mere impressions; but it is quite fair to add that the impressions conveyed to the minds of the large and intelligent sanitary staff, whose daily duties have brought the entire operations of the Trust under observation, as well as to my own, are in harmony with the facts stated concerning that section of the operations which was carried out at last May term.

1. OVERCROWDING OF TENEMENTS ON THE SOIL, OR OVER-BUILDING.

Every stone deposited on the surface of the earth displaces so much air, and therefore every tenement added to a city removes further from its inhabitants the great store of outer atmosphere from which alone the air vitiated by the functions of their lives, and the processes of manufacture, can be renewed. Hence there must be broad passages left for the entrance of air from the open country, and spaces preserved, which not only are reservoirs of fresh air, but the soil of which will provide playgrounds, places for rest or exercise, and sites for ashpits, washing-houses, and other conveniences necessary for comfort and even for health. A study of extant maps of Glasgow throws considerable light on the natural history of this form of overcrowding in old Glasgow. The idea of the city was, central thoroughfares east and west, and north and south. End-on to the building-line of these streets we see long narrow strips, extending in what was the natural direction of the growth of a house placed endwise to the street—*backwards*, looking on the maps like sections of geological stratification, with cracks or flaws between. These were the closes or wynds—parallel intervals left between tenements simply for convenience of access, only wide enough to permit two persons to pass, or perhaps a barrow or a cart. Each proprietor was bent on covering every inch of his grounds with his building, and the only function exercised by the Dean of Guild Court was that expressed in the phrase, which is still in use, "to grant a lining," that is, to see that if he *built up to*, he should not *build over* the line of his holding. What the result was in process of time has been graphically described by Sir James Watson, and so recently quoted by Bailie Morrison, that I need not dwell further on the picture. At the end of last century, in the first extensions of the city in the feuing of Tradeston, Hutchesontown, Laurieston, Cowcaddens, &c., a different principle was adopted, which gave a new direction to this form of overcrowding, although at the same time it increased the number of streets in proportion to the surface occupied. We may call this the hollow-block plan, appearing on the map as the outlines of squares or parallelograms. These were not happy designs for the free circulation of air, but year by year you find black squares planted in the middle of those hollow squares, and long lines budding out from the sides, or running parallel within a short distance of the sides. This was the new development of overcrowding or over-building. Just as a mason erects the solid shell of his wall and then fills up the interval with packing, so the proprietor first built his block like a box, and then packed it with other houses, in many cases placed back to back. Hence those ominous black squares on the Post-Office Map of the present day. The operations of the Improvement Trust are almost entirely confined to the product of the older form of over-building, but they are scarcely less needed in the localities which have been spoiled by this more recent development.

The next question is, How far have we profited by the lessons of the past, and succeeded in preventing the continuance of this over-building? My answer is, Not so much as we ought to have profited and prevented it. When the Trust has finished its work, our streets will be the finest in the world. We are also getting squares and parks and other breathing spaces. We have got entirely rid of the old way of development of buildings parallel to each other, and vertical to the line of the street; but if you look at our Post-Office Map, you will find it studded year by year with more of these squares, like the block plan of boxes; and if you go and inspect those squares *in situ*, you find that boxes they are to all intents and purposes, containing stagnant air. If the process of over-building is developed to its next stage, by packing those boxes to any degree with buildings of any kind, whether intended for dwellings or not, then you reproduce to the full the old evils. I admit, of course, that there is no chance of this being done in the present day to the extent to which it has been done in the past; but I think I am quite safe in asserting that the principle that a building of any kind displaces vital air, and impedes its circulation, is not sufficiently acknowledged in the powers of the Dean of Guild Court for preventing over-building. It is barely worth consideration whether a tenement which darkens my windows and impedes the access of fresh air to my house is a warehouse, or a singing saloon, or a four-storied land of dwelling-houses. But apart altogether from the aggravation of packing those hollow blocks with further erections, I venture to suggest that they are in themselves faulty, and that some other principle of ground plan should be adopted which would permit a free current of air along the back as well as the front of every tenement.

2. OVERCROWDING OF DWELLING-HOUSES IN THE TENEMENT, WITH INTERNAL DEFECTS OF STRUCTURE.

The aggregation of dwellings in the tenement is an essential feature of the Scotch system of flats with common stairs, as contrasted with the English system of self-contained houses with common courts. The attendant evils, to the mitigation of which special attention ought to be paid, are the vertical accumulation of houses by the imposition of successive flats, and the horizontal or lateral accumulation of houses in the flats, involving the removal of the house still farther from the air and light, which possibly are already greatly debarred by over-building; the vitiation of the air with animal excreta which inevitably follows, and the tangible dirt which is always associated with darkness. The Scotch system also necessitates a much greater degree of personal contact and communion than the English. The result of this in a tenement over-crowded with houses, and defective in internal structure to boot, is that the inhabitants actually breathe and swallow each other as well as come into bodily contact. The stairs and lobbies have that curious indescribable sour smell which can be perceived the moment you enter a close in the overbuilt part of our city. This co-operates with internal overcrowding in producing a low state of vitality and that constant irritation and defective discharge of the functions of the lungs which issues in bronchitis and consumption, and makes the city, so to speak, asthmatic. Then consider the circumstances of poor children in such tenements. Raised above the street level to such a height, and separated from such scant and dangerous room for play and exercise as those streets and courts afford, by dark lobbies and steep dark stairs, what can the poor things do? The playground of most of the children of Glasgow below five years of age is the lobby and the stairhead. It is a sorry thing to hear their voices, and to feel them, for often you cannot see them, running about or sitting in groups in such places. No wonder that they are deformed with rickets and prematurely aged; and as to the mortality which prevails among them, the marvel is that so large a proportion of them ever reach adult years. As for stamping out epidemic diseases, such as scarlet fever, measles, and whooping-cough, in such circumstances, it is impossible; and it is only by the rigid enforcement of hospital treatment that their parents and the adults who live in these localities can be saved from decimation with typhus—that scourge of overcrowding and dirt.

This, then, is a broad and hurried sketch of the evils to which the system of flats, especially when accompanied with undue vertical extension and overcrowding of dwelling-houses, in the flats, tends. What can we do, and what have we done to reduce them to a minimum? The chief structural defects are in our *common stairs* and our *lobbies*.

The common stair of a Scotch flatted tenement is the analogue of the English court, not only as the means of access to the houses, but especially in old buildings, in respect that it contains the common jaw-box—the representative of the English gully-hole—and the common water-tap for the supply of water; and in modern buildings in respect that it contains the common water-closet, the representative of the privy or trough water-closet which stands at the head of the English court. Yet with all this similarity of function, the English court is at the worst a box open above to the free air, while the Scotch common stair is *at best* a longer, narrower box, fully open only at the lower end, with or without certain mockeries of ventilators at the upper end, and with windows at intervals, which may admit light, but are never opened, and serve no useful purpose for ventilation until by a providential accident, or a merciful exhibition of malice, the panes of glass are smashed. In their *worst* form it is hard to say what the Scotch common stair is, but a dark, noisome tunnel buried in the centre of the tenement, and impervious both to light and air, excepting the fetid air which is continuous and undiluted from the house along the lobbies and down to the close, from which you start on your perilous and tedious ascent.

Now, I confess to you, I do not think we have made much progress in recent times in the structure of our common stairs. In the oldest houses the best form probably was the turnpike standing outside the main wall, like a huge round chimney stalk, the worst was the same turnpike running up through the heart of the tenement; but there were also good broad stairs with roomy landings, having windows in the main wall, and so making ventilation from the outer air possible. The more recent introduction of the hanging stair, in place of the turnpike in the centre of the tenement, ensures a passage of air right up to the roof, instead of only along the length of the stair. This with ventilation at the top is an improvement, but it still falls very far short of what ought to be.

Rather than dwell on those architectural details, of the terminology of which I know little, I shall endeavour to give my notion of the principles which it is the business of the architect to carry out in the structure of a common stair.

1. It should touch the open air at every flat or landing between the flats. I have been told that this is impossible in corner tenements, and I know it is seldom done in such situations; but it is just there that the greatest need of ventilation exists, because of the number of dwelling-houses having access to the stair in a corner tenement. I do not believe in impossibilities of this kind, and there is no doubt this condition would be complied with even there, if made compulsory.

2. A common stair should not only touch the open air, but the air should have free access independent of the control of any tenant. Fresh air is as essential as fresh water, and should

be brought to each individual door. The individual householders may please themselves on the matter of admitting the fresh air further, but it should not be possible by closing a window to deprive all the neighbours of this necessary of life. In Mr. Carrick's model houses in Drygate, and in a tenement in the Northern District, there is a free space in the main wall at each landing, protected by a railing, while in Dr. Hill's property, recently erected on Garngad Hill, the common stair is a turnpike outside the main wall, and the air blows freely across each landing by an equally perfect arrangement of structure.

3. Such a thing as a common stair which requires to be lighted artificially in the day time should not exist, and, of course, would not exist if the previous conditions were fulfilled.

4. The last defect in our common stairs to which I shall allude is the universal want of proper ventilation at the top of the staircase. This is a most important matter when there are windows and water-closets on the stair—these windows, as already remarked, when a harmony of opinion among a dozen house-wives has to be obtained before they are allowed to remain open, being good for nothing as an access for air. There should always be some equivalence between the area of apertures admitting fresh air and those giving egress to foul air. Yet, as a rule, the top of those stairs is hermetically sealed with a glazed skylight, and perhaps there is a hole entering beneath the roof, or an aperture in the skylight about six inches square, or even less.

So much for common stairs. Let us now turn to the lobbies which give access to the stair, and ought to lead the fresh air to the very doors of the dwellings.

If we inquire into the natural history of the lobbies of the buildings within the area of the operations of the Improvement Trust—those T lobbies and L lobbies, and infinite long lobbies, of which you have heard so much—we find that the immense majority of them have risen in this way, by throwing open the front door of a large house and letting each several apartment to a separate tenant, a process technically known as "subdividing" or "making down" a house. You will remember to what use for rhetorical effect Dr. Guthrie puts this practice in his sermon, *The City: its Sins and Sorrows*, when he compares the lower parts of Edinburgh to a submerged forest: "In their economical, educational, moral, and religious aspect, certain parts of this city bear palpable evidence of a corresponding subsidence. Not a single house, nor a block of houses, but whole streets, once from end to end the homes of decency and industry, and wealth, and rank, and piety, have been engulfed. A flood of ignorance and misery and sin now breaks and roars above the top of their highest tenements." This is the poetry of facts; but we have at present to deal with the effect of such a change on what was once the lobby of a private house, but what is now the lobby by which access is obtained to six, eight, or more distinct houses occupied by as many families. It is hardly necessary for me to enter into details. Let any one of you imagine what would be the state of matters if your own private residences were suddenly to suffer such a change; then bethink yourselves of the condition of a common stair in the Saltmarket, which gave access in olden times to four or five houses, of, say, six apartments, but which now accommodates from four-and-twenty to thirty families. If any of you wish to see easily recognisable illustrations of a more modern kind, you will find them in St. Andrew's Square.

Although the immense majority of those lobbies were, as I have said, originated in this way, a few were primarily planned as we find them; begotten, let us suppose, in the minds of young architects under the evil influence of the examples furnished by the made-down houses.

Now arises the question, Have we profited by the lessons which experience ought to teach us in reference to this practice of "sub-dividing" or "making down" houses? I am sorry to say not in the least. The plan of a house is the elaboration of an idea, the consistency and general correctness of which, in a sanitary point of view, rests upon the fitness of the design to the mode of occupancy. Disturb this relation in any way, and you land at once in a condition which was never anticipated or provided for by the architect. If a man takes a house which was originally designed as a segment or fraction of a house, he is somewhat like one who buys one article of what was to him who possessed the whole a complete suit, and fancies that he is fully clothed. Yet to this day there is no check on this sub-division of houses, and the City Assessor will tell you that year by year, where formerly he had but one tenant in his roll, he finds that there are several. There have been no structural alterations, no authority has been asked from the Dean of Guild Court, no one is consulted in the public interest. A landlord finds that a demand for one or two apartment houses has arisen in the locality where he had three or six apartment houses that will not let. Like his predecessors in the area of the Improvement Trust, he merely throws open the front door and makes down his three or six apartment houses to meet the demand. This is in effect the erection of a new tenement, and a considerable proportion of our smaller-sized houses are produced in this way. If at the end of a lobby running in a straight line from the landing you have two houses of three apartments, and these are made down into single apartment houses, you have at once a T lobby of the worst description. If you have two front doors on a landing, opening into houses of four to six apartments, and these are made down, you will probably have two L lobbies. No matter with what intelligence and care the original plan may have been drawn, and however healthy and unobjectionable the houses may have been, no sooner is the mode of occupancy altered than the whole plan becomes disorganised.

In the present state of the law this process cannot be prevented, and can be remedied only *after the fact* by the certificate of the Medical Officer, that there are in such a tenement lobbies defective in light and ventilation, so as to be a nuisance and injurious to health. This ends in a reference by the Sheriff to an architect or an architect and a doctor, and perhaps in a tedious legal process, which may or may not lead to the remedy of an evil which ought never to have been allowed to come into existence. Obviously there ought to be no alteration in the mode of occupancy of a tenement until authority has been obtained from the Dean of Guild Court. The result of such an enactment would be that the alterations requisite to ensure the necessary light and ventilation would be enforced before the change, and before any injury was done to public health. We see daily how far proprietors can look before them in the erection of houses on the street level, which may ultimately be more profitable if let as shops. Any hardship involved in such a rule as I have mentioned would probably be obviated by a similar provision in the drafting of the original plans. However this may be, I have no doubt that your more modern tenements of working and middle-class houses, built on the box plan, will, if subjected to this process of making down, become in a few years little better than the rookeries which you are now demolishing, and which were produced by the same process.[1]

As in the case of the common stair, the principal points to be remembered in the construction of a lobby are these :—

1. It ought to lead fresh air to the very doors of the dwellings to which it gives access. The ventilation should be such that no stagnation can be possible, making the air of the lobby and of all the houses opening into it continuous and common. A tenant ought not to be able to send his aerial sewage into his neighbour's house along the lobby any more than to cut off the fresh air by keeping a stair window shut. In the case of long lobbies with many small apartments, or in the case of lobbies with angles and tortuosities, nothing but through-and-

---

[1] The abuse in English houses, corresponding to that of "making-down" in Scotch flats, is "sub-letting," which would require to be regulated by special legislation.

through ventilation from the stair at one end to the open air in the main wall at the other will be effective. Yet it is not uncommon to find the lobby door in a house which has been made down still in use and shut at night, producing inside a condition something like that of the Black Hole of Calcutta.

2. Darkness in a lobby is most objectionable—it nearly always means dirt, and can never be consistent with ventilation.

3. OVERCROWDING OF THE INHABITANTS IN THE DWELLING-HOUSE, OR OVERCROWDING PROPER.

The last of the evils with which the Improvement Trust contends is *overcrowding of the inhabitants* in the house, or overcrowding proper.

Overcrowding of the house has no direct relation to the structure of the tenement, and consequently any effect which the operations of the Trust may have upon it is not so direct as in the case of over-building and overcrowding of houses in tenements. I believe that in and of itself the overcrowding of houses is worse in its moral and physical effects than either of the other forms of overcrowding to which I have alluded. No tenement of flatted houses, however well planned and however surrounded by free space, can be over-populated without becoming a hotbed of disease and (especially if lodgers are the extra inhabitants) immorality. As to the history of this vice of our cities (for it is, in fact, a vice inherent in a great part of our population, not a necessity of structure or even of circumstances), I believe it came to us with the Irish, or at least attained its fullest development with their advent. There can be no doubt that it is the Irish and Scoto-Irish who are at this moment the most obstinate overcrowders. There is very little of it amongst the Lowland Scotch. That worst form of overcrowding—the introduction of lodgers within the family circle—is almost confined to the Irish.

As to the prevention of overcrowding, I believe that it is a vice which will, probably, never be eradicated from a large mass of our population. I mean that, suppose you had every family in a duly proportioned house to-morrow, if you simply let them alone for six months, you would find them living like pigs again. It is a vice closely related to intemperance, both as a cause and as an effect. In 1865, in his Report to the Privy Council on the "Housing of the Poor in Towns," Dr. Hunter said—"From one point of view crowding in Glasgow means the diversion of income from rent to supply whisky." This still holds true of those habitual over-crowders; but I am afraid it must be said that many of our respectable Scotch artisans have a great deal to learn in the distribution of their outlay between house, food, and dress. They fancy every shilling which can be pinched off the rent is a clear saving, while on food and dress they spend freely, if not extravagantly.

Glasgow was the first city to grapple with this evil in the Police Act of 1862, which gives power to measure the cubic contents of any house consisting of "not more than three apartments," and if the cubic contents are found to be under 2,000 feet, to affix a ticket on the door on which the cubic space and the number of inmates proportioned thereto is stated. All such houses may thereafter be visited at night, and a fine may be imposed for an excess of inmates or overcrowding. These were extraordinary powers; but no one who knows anything of the habits of the people affected by them (who are not the working classes as we see them pouring from our shipbuilding yards and engine works, in short, not the artisan, but the unskilled labourer and the grade lower still, our criminal classes) can have any doubt of their necessity; nor, I am glad to say, can any one who knew Glasgow as it was then and knows what it is now, have any doubt as to their efficacy and usefulness. Still, if you relaxed your repressive efforts, the old state of matters would return in a few weeks. The transference of those people from the Bridgegate to new tenements, let us say, in Nuneaton Street or Hopehill Road, will not at once divest them of their habits, though possibly by keeping them forcibly during one generation in circumstances of decency and health, new habits may grow up and become stable in their descendants. But we must not be restrained by any squeamishness about ticketing new property, and so giving it an ill name, if we find overcrowding has been transferred with the old tenants of our demolished houses. If a landlord finds that such process deteriorates the value of his property, then he must prevent the overcrowding, otherwise ticketed it must be.

Only two remarks occur to me with reference to the enforcement of the law against overcrowding, which, of course, rests with the magistrates.

1. I think no mercy ought to be extended to overcrowding which is caused by the introduction of lodgers into the family, cases which are subjected to heavier penalties when the house has been scheduled as "let in lodgings." There can be nothing more abominable and vicious in its results than this habit of taking strangers, generally young unmarried men, into a house which is already straitened to accommodate its legitimate occupants. Admonitions will not remedy such cases—only fines, which will make the violation of the law a losing game, will put them down.

2. In cases where the overcrowding arises from a family having grown beyond the dimensions of the house, or where only the members proper to the family are found in it, I think there is room for the exercise of a discretion based upon a broad consideration of the entire circumstances of the family, which would be paternal if not exactly judicial. These circumstances are the income of the family, and whether there is any vicious source of outlay, such as intemperance. Where you find a husband or a wife expending in drink what should go to the additional rent of a larger house, it would be not only just but kind to compel them to go to a larger house, and so perhaps convert an evil into a good. Also where members of the family are working as well as the parents, a large sum of money is frequently coming in, while the inmates are living in a way which is not only injurious to health but indecent. Again, it is not uncommon to have daughters bringing husbands into a crowded house, and sons bringing wives, a violation of all decorum, at best a false economy, and very often associated with improvidence, if not intemperance.

In all cases even of family overcrowding, a dirty house should be visited with a penalty. Dirt intensifies the dangers of overcrowding, and is an indication of the social degeneration to which it tends. By the introduction of such considerations as those, the legislation against overcrowding might be made a powerful lever for the elevation of the population to a higher ideal of the domestic life and to habits of self-denial, for the purpose of maintaining that ideal.

In conclusion, the operations of the Improvement Trust must in themselves be productive of good, inasmuch as they expel, from circumstances than which none worse could be found or imagined, a body of morally debased and physically deteriorated inhabitants, and make straight and spacious thoroughfares, in place of cramped and inconvenient wynds and closes. But, as in war, a body of troops may be well equipped and act effectively and successfully against the enemy, and yet the ultimate success of their arms may depend upon the co-operation of other bodies of troops who ought to be moving towards the same point at the same time, so the operations of the Improvement Trust against the "moral and physical" evils alluded to in the preamble of the Act, depend for their thorough success on support from other parts of the field. My statistics show, I think, that the Trust is doing its part well, and that the *immediate* results are good; but we must see to it, that we are not building up with one hand houses which may, for want of sufficient restrictive and regulative power, become as bad in process of time as those which we are pulling down with the other. We must also continue to look to the habits in the new localities of the people who have been expelled from the old, and by a constant pressure compel them to distribute themselves, and endeavour to divert from intemperance and improvidence towards house-rent a larger proportion of their earnings.

I am no alarmist; but no one can comprehend the importance of this matter of house construction to the future of Glasgow, unless by placing clearly before his mind two facts :—(1) The enormous number of dwelling-houses being erected from year to year—since 1866 no less than 26,794; and (2) above all, the small size of those houses. Actually, of those 26,794 built since 1866, 25 per cent. were houses of one apartment, and 50 per cent. houses of two apartments, leaving only 25 per cent. for all sizes above two apartments, and of that 18 per cent. were houses of three apartments. One cannot be too anxious or exacting concerning the ventilation and general arrangements of such clusters of small houses. Mr. Chadwick has said somewhere that towns might be built by contract guaranteed to produce an average death-rate, according to the honesty and completeness of the sanitary provisions. I do not believe this statement without qualifications; but I doubt very much, if specifications were issued for a town of 26,000 houses, to be erected in hollow blocks containing 200 a piece or thereby, piled up in four flats and a "sunk" entering from a court behind, with inside staircases at the corner tenements, the size of house over all to average 25 per cent. one apartment, 50 per cent. two apartments, 18 per cent. three apartments, and the remainder in larger sizes, whether any contractor would be found willing to guarantee, on such conditions, an average death-rate below 25 per 1000 per annum, and even that only with the proviso that not one of these houses should ever be "made down."

(2) "*Further Information*" *regarding the Displacements at Whitsunday, 1875.*[1]

Gentlemen,—It is due to myself to explain that I am here to-night, more at the urgent solicitation of the President of this Section, than in accordance with my own desire. Circumstances render it almost impossible for me to produce anything sufficiently new or matured to deserve attention; and I merely propose to lay before you some facts regarding the immediate results of the operations of the Improvement Trust on the inhabitants displaced by their operations at the May term of 1875, similar to those which I formerly gave you regarding their operations at the May term of 1874. The information contained in my previous paper was transmitted by the Glasgow authorities, along with other documents, to the Secretary of State for the Home Department, and was, with similar information furnished by the City of Edinburgh and the Burgh of Liverpool, printed and presented to Parliament, for their guidance in the discussion and enactment of the Artizans' Dwellings Bill. It is therefore important to check previous conclusions by further facts.

---

[1] Portion of the Opening Address as Vice-President of the Sanitary Section of the Philosophical Society of Glasgow. From *The Glasgow Medical Journal*, April, 1876.

At the May term of 1874, there were only 351 families displaced; and of these, for various reasons, only 243, embracing a population of 990 persons, were available for the purposes of my inquiry. At the May term of 1875, no less than 818 families were displaced, of whom 655 are available, embracing a population of 2720 persons. Of the balance of 163 families or houses, the large majority—viz., 145—are necessarily excluded, because we were unable to trace them to their new residences. People of that class are very suspicious, and I have no doubt, in many cases, intentionally obscured their retreat; while others had removed before the officers called. Of the others, eight lived in premises connected with shops, while six lived in a new property on the "Bell-o'-the-Brae," and the remainder were common lodging-houses, these being circumstances which removed those holdings, in point of rental, &c., from the category to which the 655, retained for the purposes of this inquiry, almost all belonged. That this large residue, so purified of sources of error, really represents the class of house with which the Artizans' Dwellings Acts was intended to enable Corporations to deal, will be at once apparent from the fact that no less than 84 per cent. were ticketed either as houses of not more than three apartments, and under 2000 feet of cubic space, under the Glasgow Police Act, or as houses let in lodgings, under the Public Health Act; and that, therefore, 84 per cent. of the inhabitants lived under the strict surveillance which houses so ticketed entail on their inmates. Being, therefore, so strictly of the proper class of house and inhabitant, the much larger numbers dealt with on the present occasion (655 families as compared with 243) give my conclusions a much broader basis. I am happy to say they are, on the whole, quite the same as were derived from the narrower basis; and as such inquiries are extremely laborious and troublesome, this paper, in connection with the last, may safely be taken as placing beyond question the nature of the *immediate* results of the operations of the Improvement Trust upon the inhabitants displaced. As to the *ultimate* results upon the health of the community, time is a necessary condition of their development. In the Parliamentary paper to which reference has just been made, Dr. Littlejohn says in reference to this wider and more complex question, "As Medical Officer of Health I would not trust to any statistics that were not based on an experience of at least ten years," an opinion in which I entirely concur. But if I were asked whether we in Glasgow have gone about the renovation of our city in the way most likely to derive the maximum return of good results, I should distinctly say, No. One of the first principles in the development of any scheme of improvement, under any Act, local or general, should be to see that the building regulations are such as will give material expression to the accumulated lessons of the past. A thoroughly devised Building Act is a necessary complement of an Improvement Act; and to work out an Improvement Act, conceived in the light of the most advanced sanitary intelligence, while the reconstruction stimulated thereby is regulated by a Building Act, it may be, half a century behind in its conceptions of the demands of public health, is to do only half a good work, and lose a golden opportunity, which will soon be thought of with regret.

The area of the operations of last May term was chiefly the Gorbals and the High Street. Only a few houses were demolished in the Eastern district. There are some differences in the facts regarding those areas singly, especially in the quality of the property, which was decidedly worse in the Gorbals than in the High Street area. In point of construction and design, it may be said that many of these old houses fronting the High Street, if simply restored to their former mode of occupancy, as single instead of multiple holdings, would put the houses of a similar class erected now-a-days to shame. But the tenements in Gorbals were much less substantial to begin with, and much more wasted and worthless. However, we shall throw all the facts regarding these demolitions together, and consider them in the aggregate, following the same order as in my former paper.

1. *Size of House.*—*Before* the operations, of the 655 houses, the families occupying which were subsequently traced to their new abodes, 360 were houses of 1 apartment; 234 of 2 apartments; 39 of 3 apartments; 21 of 4 apartments; and 1 of 5 apartments. *After* the operations, those 655 families were found to be occupying 273 houses of 1 apartment; 267 of 2 apartments; 48 of 3 apartments; 11 of 4 apartments; and 1 of 6 apartments; leaving 55, of whom 25 had gone into lodgings; 9 had removed to various parts of the country; and 16 had emigrated—gone to Ireland, or otherwise disposed themselves forth of the city. Reducing these figures to percentages, so as to facilitate comparison, we find *before* the operations of the Improvement Trust, 55 per cent. of those families living in

houses of 1 apartment, and *after* 42 per cent.; *before*, 36 per cent. living in houses of 2 apartments, and *after*, 41 per cent.; *before*, 6 per cent. living in houses of 3 apartments, and *after*, 7 per cent.; *before*, 3 per cent. living in houses larger than 3 apartments, *after*, 2 per cent.; leaving a balance of 8 per cent. who betook themselves to lodgings, to the suburbs, to the country, &c., &c. By taking the families as we originally find them in each class of house apart, and tracing them thence to their new abodes, and noting the condition as to size, we get a more minute and interesting aspect of the same facts. Thus, of the 360 families in houses of 1 apartment, we find 220 still in houses of 1 apartment, while 99 are in larger houses, 23 in lodgings, 8 in the country, 1 in the suburbs, and 9 otherwise disposed of—emigrated, gone to Ireland, in the poorhouse, and in one or two cases in prison. So of the 234 families in houses of 2 apartments, we find 151 still in houses of 2 apartments; while 24 occupy larger houses, and 51 have taken smaller; 2 having gone into lodgings, 1 removed to the suburbs, and 5 otherwise disposed of themselves. Of the 39 families in houses of 3 apartments, we find 11 still in houses of 3 apartments; 8 in larger houses, 15 in smaller, 1 in the country, 3 in the suburbs, and 1 in premises connected with a shop. Of the remaining 22 families in houses larger than 3 apartments we find 3 still in houses of equal size, 1 in a larger house, 17 in a smaller, and 1 in premises connected with a shop. It will be observed that the occupants of 25 houses ceased to become householders and went into lodgings. This is about 4 per cent. of the families displaced, and embraces 71 individuals; giving a proportion of less than 3 per house, and indicating that they were for the most part old persons, widows, or persons without families. Of the 25 families who went into lodgings, 21 belong to the Gorbals area, being 6½ per cent. of the families displaced, a very clear indication of the propriety of the erection of a model lodging-house in that district, which I believe the Improvement Trust are about to do. Indeed, while the Trust has very properly refrained from entering upon general building enterprises, I think they might very wisely extend their model lodging-house accommodation. They pay well, and they meet a clamant necessity. At the census of 1871, it was found that 23 per cent. of all the families in Glasgow kept lodgers, but it is only when we discover among what class of householders the practice most prevails, that the important relation of this fact to health and morality will appear. Of the families who lived in houses of 1 apartment 14 per cent. kept lodgers; of those who lived in houses of 2 apartments, 27 per cent. kept lodgers; of those who lived in houses of 3 apartments, 32 per cent. kept lodgers. Unfortunately, while the reception of lodgers brings the house within the scheduling powers of the Public Health Act, the authorities have no power to forbid their reception, so long as no overcrowding takes place. So it is even with common lodging-houses. The authorities have a very limited power over their structure and plan, and I am frequently required to determine the number of beds to be licensed for such premises, when I should prefer to say that these premises are totally unsuited for such a purpose. The common lodging-house is the hotel of the great floating body of persons in search of employment, and the boarding-house of the labouring man and woman without family ties. Such persons are an evil in the private household, and to make special provision of a proper kind in suitable buildings it must be done on a large scale, and requires capital. Many of our large lodging-houses are unobjectionable in their construction and management, and nothing is more agreeable than to find a few flats of made-down, and therefore dismal, unhealthy houses, the majority let in lodgings, falling into the hands of an enterprising man, cleared of their artificial partitions and filled with rows of clean beds. But still, as a rule, common lodging-houses are not structurally adapted for the purpose, and I should like to see provided, either by the Improvement Trust or by private enterprise, preferably by the former, many commodious houses, not in obscure corners, but on prominent sites, near such populous centres as the Cross, Bridgeton Cross, Gorbals, Anderston, Cowcaddens, where the people have been in the habit of congregating and of obtaining lodgings. If this were done, and indeed in any case, the authorities ought to have the power not merely of regulating the use of premises as lodging-houses, but of deciding whether such premises are fit to be so used. In this way many of the smaller class of common lodging-houses which are totally unfit for the purpose, in the hands of people of no means, and often of no character, harbourages of thieves and prostitutes, would be abolished, and a large class of the community would be brought under discipline and live in circumstances healthier for themselves, and therefore less dangerous to the public health. This is particularly illustrated by the experience of model and even common lodging-houses as to infectious disease. I do not remember ever hearing of a case in the Trust establishments; and in a well-regulated lodging-house, if a case does occur, the disease never spreads, and yet the inmates are, in the condition which to them unfortunately, however unnatural, is a state of nature, "food for fever." But as I have said, common lodging-houses are not all what they ought to be, and may become depôts of fever, and distribute it for weeks, unless absolutely shut up and the most extreme measures adopted which the law permits.

2. *Rental of House.*—The average monthly rental of the houses demolished in the Gorbals was much lower than in the Central district, a remark which was made also in my former paper. It was for a 1-apartment house, in Gorbals, 6s. 9d. per month; in the Central, 7s. 1½d.; for a 2-apartment house, in Gorbals, 9s. 10¼d.; in the Central district, 10s. 6½d. The families displaced in Gorbals also got houses at a lower rental than those displaced in the Central, the addition being almost proportional on the original rent. It is better, however, as in considering the size of house, to throw all the districts together, when we obtain the following result:—Those families who in the *old* buildings occupied a house of 1 apartment, at an average monthly rental of 6s. 10½d., paid in the *new*, for the same size of a house, 8s. 0¾d., an increase of 17 per cent. on their formal rental. Those families who, in the *old* buildings, occupied a house of 2 apartments, at an average monthly rental of 10s. 1¾d., paid in the *new*, for the same size of house, 12s. 3½d., an increase of 21 per cent. on their former rental. Those families who, in the *old* buildings, occupied a house of 3 apartments, at an average monthly rental of 16s. 2¼d., paid in the *new*, for the same size of house, 18s. 10¼d., an increase of 16½ per cent. on their former rental. Similarly, a house of 4 apartments, in the *old* buildings, cost 19s. 9½d. per month, and in the *new*, 30s. 7½d., an increase which necessitates the repetition of the remark made last year, that whereas a house of 4 apartments in the old buildings was a sham, in the new it is a reality, and, therefore, must be paid for, as substantial goods must always be, with a substantial price. Indeed, the remark may be extended, though with less emphasis, to the whole of this increased outlay for rental, which was probably that aspect of the enforced change which would bulk largest in the minds of those persons. In the main, there can be no doubt they had a better article for the money, better accommodation, and more conveniences, which cannot be estimated statistically.

3. *Number of Inmates in House.*—One of the advantages which may underlie a change from one house to another of the same size, but at an increased rent, is additional house-room or space. Although I have the cubic contents of most of the old houses, I have not of the new, but the proportion of the inmates to the house is, if not as good commercially, better sanitarily, as an indication of the circumstances of the inmates as to accommodation. The *old* houses of 1 apartment had an average of 3.4 inmates, the *new* of 3.3 inmates; the *old* houses of 2 apartments had an average of 4.7 inmates, the *new* of 4.6 inmates; the *old* houses of 3 apartments had an average of 6 inmates, the *new* of 6.2 inmates; the *old* houses of 4 apartments had an average of 6.3 inmates, the *new* of 4 inmates.

On the whole, therefore, in the houses of smaller size at any-rate, the tendency has been to re-assort the families displaced into houses proportionally larger than those they were compelled to leave. The broadest expression of this fact is obtained by taking the average, not per house, but per apartment in all the houses, when we find that in the *old* houses there were 1034 apartments to 2720 inmates, while in the *new* houses there were 1001 apartments to 2509 inmates, giving 2.5 inhabitants for each apartment in place of 2.6 All these comparisons go on the presumption that the same inhabitants will go into the new house as left the old, and that no attempt will be made to turn increased accommodation to account by taking in lodgers and overcrowding. Unfortunately the tendency is too certainly in the opposite direction, and having left houses of which 84 per cent. were ticketed, and measures taken to keep down this tendency, if these people find themselves in their new residences suddenly relieved from this restraint, their last condition will soon be worse than their first. I may say, however, that the Committee of Health have given me full powers to require ticketing of houses, wherever the habits of the people or the prevalence of disease indicate the necessity and the law will permit it to be done.

4. *Method of Excrement Disposal.*—Another item of advantage which may be covered by change, even with increased rental, is greater convenience and less nuisance in the method of excrement disposal. This also may be indicated in a rough way statistically. For this part of my inquiry I have the facts as to this branch of social convenience concerning 556 families, embracing 2334 souls. Before the demolitions at last May term, only 7 per cent. of these families used water-closets; whereas 14 per cent. do so now. To the large remainder who still use public privies and ashpits, there is this undoubted improvement that, on the whole, these conveniences are better constructed, and especially better situated, so as to be less a source of nuisance and injury than in the confined spaces available in the old parts of the town. Of the water-closets themselves—in the *old* houses 36 were *in* the houses, and only 4 on the stair; whereas in the *new* houses—43 are *in* the houses, and 35 on the stair, where they ought always to be in houses of this class. The result of my former inquiry was to show that 13½ per cent. of the families displaced were, by the change, provided with water-closets, in place of only 4½ per cent. So that we have, as an undoubted and immediate effect of the reconstruction of the city, an increased pollution of the river considerably beyond what the natural increase of our population would produce. I apprehend also that from this progressive withdrawal of the excrement of the population from

the possibility of utilisation, the total refuse of the city—with which our Cleansing Department has to deal—will become less and less valuable, and therefore more difficult to get rid of. At present our manurial refuse is employed as a means of disposing of our non-manurial refuse. Under cover of the former, we strew the fields, for miles around, with our rubbish, the farmer being rewarded for the trouble of gathering up our broken bottles, earthenware, boots, and other miscellaneous contents of our ashpits, from his land, by the intermixed manurial elements which the rain washes into it from these foreign bodies. This will become less and less possible as the proportion of our excretions lost in the sewers increases; and we shall be compelled to study the economics of our ashpits in a scientific way, which we have not yet done.

5. *Distance from the Centre of the City.*—There is no doubt the farther from the heart of the city we have our homes the better. We may have to go down into the city to earn our bread, but the place where we sleep and where we rear our families should be as near the outer verge as possible. We shall find that in this respect also an immediate result for good has been effected by the Improvement Trust, and one also which admits of partial statistical expression. I have again taken the Cross as the centre of the city, and have determined the distance therefrom of 626 families before and after last May term, the addresses of the remaining 29 not being sufficiently definite to admit of the distance being ascertained. *Before* last May term, 165 of these families lived within a quarter of a mile of the Cross, 294 within half a mile, and 167 within three-quarters of a mile; *after* last May term, those families found themselves distributed thus over the city:—102 within a quarter of a mile of the Cross, 190 within half a mile, 198 within three-quarters of a mile, 49 within one mile, and 32 within one and a half miles. Of the remaining 55, there were 5 who lived in the suburbs, 25 in lodgings, and 25 elsewhere remote from the city. If we reduce these figures to percentages, the change will be more evident. *Before* the term, 26 per cent. of those families lived within a quarter of a mile of the Cross, *after* it only 16 per cent.; *before* the term 47 per cent. lived within half a mile, *after* it only 30 per cent.; *before* the term, 27 per cent. lived within three-quarters of a mile, *after* it 32 per cent.; and this is the crest of the wave of dispersion, which gradually falls to 8 per cent. within one mile of the Cross, 5 per cent. within one and a half miles, and scarcely 1 per cent. flowed over into the suburbs. Speaking still more generally, those operations found all the families affected living within three-quarters of a mile of the Cross, and left 14 per cent. at various stages beyond that limit; within that limit also dis-

persing them outwards. My former inquiry showed that while all the families then displaced lived within three-quarters of a mile of the Cross, in their original dwellings, 19 per cent. were spread beyond that limit, only 2 per cent. actually overflowing the municipal boundaries. We are, therefore, able to form a very clear idea of the nature of the internal movements which such operations produce in our population. The effect resembles, in external form, when we confine our attention solely to the families directly involved, a wave gathering up to a crest, and then breaking and flowing out in a diminishing stream; but if we look deeper, and consider all the units of the population in whose midst this disturbance is set up, we shall find a process of displacement and substitution, whose influence is only expended when the very outer confines are reached, not merely of what is artificially termed Glasgow, but of that great community of which Glasgow is the vital centre. The class of people of whom I have been speaking cling tenaciously to their old haunts. It is wonderful how they manage to seize the nearest available corner. It is this desire, and the competition which it begets for houses of small size in the heart of the city, which stimulates the process of making down houses, on which I animadverted so strongly in my former paper. Those people go into cast-off houses just as they wear cast-off clothes, and the trade in the former commodity is as brisk and profitable in the centre of the city, or rather in the centres of the city, as the trade in the latter. A landlord finds he can double his rental by making down a house of 3, 5, 7 apartments into as many, or almost as many, houses as there are apartments, and I can best show you with what result by the most recent instance which has come under my notice, in close proximity to the area of the Improvement Trust's operations in Gorbals. This is a plan of two 6-apartment houses, comfortable, healthy dwellings, as originally designed and long occupied, but now sub-divided and let as four single-apartment houses and four double. The lobby of the private house is now the dark tunnel through which those people make their way to the stair, the common *cul-de-sac* into which the foul air from all those houses passes and where it stagnates. This change has been carried out in three flats, so that at once in place of 6 houses on this stair we have 24. I am anxious to throw another stone at this system. We are about to get those lobbies extended to the outer wall, so as to give a through draft, and shall most likely require to effect the change by a process before the Sheriff. But why should this making down be allowed without reference to the Dean of Guild or other Court governing the erection of new buildings? No reason whatever can be given for the continuance of the practice.

You will now understand how it is that although only 1 per cent. or 2 per cent. of the families actually disturbed reaches the outskirts and suburbs, still the effect on the units of our population is much wider, and its nature and tendency is to send our artizans and skilled workmen and respectable middle class outwards year by year, and increasingly, over our artificial boundaries. The space which has been cleared of those masses of unskilled workpeople will never be occupied by the same class again. A large area is consigned to railway purposes. Where buildings are being erected, they are either warehouses or shops, with dwelling-houses above, suitable for those employed about those places of business and trade. The occupation of those houses will cause a slight return current from the outskirts which will facilitate the passage outward of the lower class, and dilute the death-rate of the inner districts. This is a source of fallacy to which we shall soon be exposed. It may even come about that the death-rate in the High Street and closes, and in Bridgegate and Wynds, or Gorbals, will be lower than in districts which at present are much healthier, but we must distinguish between the district and the people, for whom we shall have to look elsewhere. In short, our general, and not our local, death-rate will be the only safe guide to the aggregate result of all those complicated internal movements.

(3) *Report upon the Result of the Displacements by the Improvement Trust at Whitsunday, 1877.*

Before proceeding to take up the new material I would remind the Trust that on two previous occasions I have submitted similar reports, viz., on the operations of the May terms, 1874 and 1875. In those reports ample information of a precise kind was given upon the relative rental, size of house in proportion to size of family, distance from the Cross, &c., of the families displaced, before and after displacement. The only *new* element in the present report is the endeavour to trace the effect of compulsory change of residence not merely upon the family, but upon the individual members of the family, especially as to the place of their employment.

I have also endeavoured to classify the occupations of the population by way of throwing light upon their social status.

The areas in which the May operations took place were in the *Central, Southern, and Eastern Districts* of the City. They involve 560 dwelling-houses, occupied by 2100 persons.

1. SOCIAL STATUS.

The social status of the persons who inhabit the houses removed by the Improvement Trust, so far as shown by their occupation, has never been stated. The fact that 247 or 12 per cent. of those 2100 persons were lodgers throws some light on the question. The following is a classification according to employment, the dependants including all the married women who had no employment except domestic work, with their children :—

1. Labourers and Employees of the Labouring Grade (Males),	419	539	Dependents.
2. Factory Workers and other Employees of the same Grade (Females),	252	67	,,
3. Tradesmen,	219	264	,,
4. Skilled Labourers,	31	30	,,
5. Miscellaneous Occupations,	71	91	,,
No information obtained,	109	8	,,
	1101	999	
Grand Total,	2100		

The large preponderance of the low-waged, unskilled labouring class in the population is noteworthy. Among the Males of the Labouring Grade, 222 are designated Labourers, and 82 Hawkers.

The Females of this Grade include 108 Millworkers, and 53 Sewers. Among the Tradesmen, the most numerous class is Shoemakers, 61; the next being Moulders, 16; Tailors, 14; and Cabinet-makers, 14. A large number of these shoemakers would better be designated cobblers, being employed almost wholly in repairs and restorations for the Old Clothes Market. Altogether, I think this statement confirms the opinion that the inhabitants of those quarters are not the artizan or working class in the highest sense of the words.

They do not include our Tradesmen, our Craftsmen, but merely our unskilled workers, the hewers of wood and drawers of water, who work into the hands of our Craftsmen; together with the large nomadic and sedimentary class, who are the lees of the higher social grades. There are only 11 Masons, 9 Engineers, 5 Blacksmiths, 2 Shipwrights, and so with the other high-waged trades. The first two classes enumerated above comprise 64 per cent. of the entire population whose designation was obtained.

2. DISTANCE OF RESIDENCE FROM PLACE OF WORK.

For the reasons referred to at the outset, it was impossible to trace many of those displaced families to their new residence, and for the same reasons in the case of many individuals even of those families which were traced, their place of employment could not be discovered. Still, it is possible to state the comparative distance of 777 adults from their work, and of 189 children from school. A distinction must obviously be drawn between the inconvenience of increased distance from school and from work. A change of school can be effected readily. Of the 777 adults, 384 were housed equally near their work, 159 nearer, and 235 further off, *i.e.*, 50 per cent. were equally near their work, 20 per cent. nearer, and 30 per cent. further off. This is a tolerably rigid statement of the actual result, but those who are said to have found houses further off were, as a rule, no great distance further off. Of the 189 children attending school, 70 were in their new residences equally near their school, 50 were nearer, and 69 were further off from it, *i.e.*, 37 per cent. were equally near, 26 per cent. were nearer, and 37 per cent. were further off.

3. CHANGE IN RENTAL AND SIZE OF HOUSE TO THOSE INHABITING SMALL-SIZED HOUSES—VIZ. 1, 2, AND 3 APARTMENTS.

The families inhabiting 324 houses of 1, 2, and 3 apartments, comprising 1368 individuals, were traced to their new residences with the following result:—

Those families originally inhabiting 188 houses of 1 apartment, numbering 715 inmates, 44 per cent. removed to larger houses. The average number of inmates in the houses of 1 apartment which they left was 3.8 persons, and in the houses of 1 apartment to which they removed 3.47 persons. The average rental of the old 1 apartment houses was £4 5s. 2d. per annum, and of the new, £5 3s. 2d.—an increase of 21 per cent.

Those families originally inhabiting 119 houses of 2 apartments numbering 566 inmates, 12 per cent. removed to larger houses and 26 per cent. to smaller.

The average number of inmates in the houses of 2 apartments which they left was 4.75 persons, and in the houses of 2 apartments to which they removed 4.66 persons. The average rental of the old 2 apartment houses was £6 4s. 1d. per annum, and of the new, £7 15s. 6d.—an increase of 25 per cent.

Those families originally inhabiting 17 houses of 3 apartments, numbering 87 inmates, 6 per cent. removed to larger houses, and 47 per cent. to smaller. The average number of inmates in the 3 apartment houses which they left was 5 persons, and in the houses of 3 apartments to which they removed 5.2 persons. The average rental of the old 3 apartment houses was £8 16s. 9d. per annum, and of the new, £11 7s. 7d.—an increase of 28¾ per cent.

Including all the families displaced, 81 per cent. paid a larger rent for their houses, 15 per cent. a smaller, and 4 per cent. the same rent. Against this is to be set the fact that 30 per cent. removed to larger houses.

The general result as to rental is practically the same as that established by the inquiries of 1874 and 1875. The property which is being removed by the Improvement Trust is the poorest house accommodation in the market, poorest because of age, disrepair, and defect of the essentials of health and comfort. Therefore it is the cheapest, and unless it be possible to build new houses of the same size and of the best quality, and yet to let at the same rent, there is nothing in this increase of rental imposed upon those families which is not the everyday experience of people who abandon the use of the inferior adulterated for the superior genuine article. They have to pay more, but they find it cheaper in the end.

I think it is also evident from the statistics as to the effect of those removals upon distance from work that, in Glasgow at any rate, however it may be in a city so gigantic as London, no hardship is inflicted in this direction. Indeed, it is obvious, looking to the relative distance of home and work even before the compulsory change, that many considerations must enter into the choice of a place of residence which cannot be estimated, and that certainly convenience to work is not the strongest. It would be well if it were, for then large numbers of our working class would live in the open suburbs who work there and persistently sleep in the very heart of the city.

On the whole, therefore, I doubt the wisdom of that clause of the "Artizans' Dwellings Act" which requires that provision shall be made for the displaced population "in suitable dwellings, which, unless there are any special reasons to the contrary, shall be situate within the limits of the same area or in the vicinity thereof, and shall also provide for proper sanitary arrangements." As to situation, except possibly in cities like London, there is no hardship in the change of locality. Indeed it is to be encouraged by facilitating tram-car and workmen's trains. As to the practicability of erecting houses on or near the area scheduled which can be let *at the same rental* as the houses demolished, it seems to me an absurd expectation. Of course, if alms-houses are to be built, or houses which so far partake of that character as to be restricted to the rental formerly prevalent a new principle is introduced, and a bad one. But, after all, will the people be thus artificially controlled in their choice of residence? I think not. Before the scheduled area can be reconstructed it must be cleared and the inhabitants dispersed. When the reconstruction is completed, the people who will occupy the new houses will not belong to the class displaced, but to the class above them, into whose cast-off houses the displaced class will go. This is exactly what takes place in Glasgow. The change induced by the operations of the Trust is not local but general—a moving upwards and outwards—affecting all classes ultimately.

(4) *An Address delivered at the Opening of the Section of Public Medicine at the Annual Meeting of the British Medical Association, Sheffield, August, 1876.*

THE GLASGOW IMPROVEMENT TRUST.

That portion of the city of Glasgow which was included in the powers of the Improvement Act of 1866 embraced about 88 acres, on which a population of 51,300 persons lived in upwards of 10,000 houses, using that word not in the structural sense attached to it in England, but in the social sense customary in Scotland, meaning that fraction of a building rented and occupied by one family. Although the Act was passed in 1866, the demolition of houses was not commenced to any important extent until 1870, the intervening years being devoted to the acquisition of the properties involved in the scheme. When such operations are carried out, the advantages anticipated are of two kinds—1, immediate; and 2 remote. In terms of the Act, the extent of the demolition and displacement at any one time is defined by Section 28. Within six months no number of inhabitants exceeding 500 can be displaced without a certificate from the Sheriff of the County, granted on evidence, that accommodation exists or shall be provided for the inhabitants displaced. In Scotland the times of year when houses are let are May and November. The May term has been preferred for the greater part of the evictions and demolitions, being the summer, when least hardship is likely to arise. On two occasions, viz., in May, 1874, and May, 1875, a minute test of the *immediate* results upon the people displaced has been instituted. The investigation extended to 1169 families, containing 3710 persons. The houses were fair samples, situated in the oldest parts of the city, of the whole property to be dealt with, and their inhabitants were of that class of our urban population which is the source of so much trouble and anxiety to authorities of all kinds. I shall not trouble you with more than a general statement of results, merely adding this assurance, that they are not guesses or approximations, but based on accurate statistics. When a householder is summarily ejected from his house, and the house demolished, the necessary immediate results are manifested in changes as regards the size of his house, its rental, the re-adjustment of the number of inmates per house, the position of the house, relative to the centre of the city, and the facilities afforded for the disposal of the excreta of the inmates.

Taking up those points in succession, the following are the immediate results of our action.

As to *size of house*, it would have been better had it been possible to state the cubic contents rather than the number of apartments; for, in reference to the comparative size as well as comparative rental, the words house and apartment, without further explanation, mean very different things as applied to the dwellings demolished and those into which the inmates removed. But, while 84 per cent. of the old houses were ticketed under the Glasgow Police Act, *i.e.*, their cubic contents were marked on the doors, with a statement of the corresponding number of inmates allowed, the majority of the new houses were not so ticketed, and consequently a sufficiently laborious inquiry would have been made still more so by the necessity of measuring those houses for the sake of comparison. After all, however, the result would have been merely to express in figures what, you may accept my assurance, is the fact, that the dwellings which those people were compelled to leave were, on the whole, so bad that it was impossible for them to find their equal or their like; and you may take it that the words house or apartment mean something more as applied to the new dwellings than to the old, more in the way of space, comfort, and convenience. You must keep this before your mind in interpreting the meaning of the following bare figures, and estimating the facts to which they give most meagre expression. We found 478 families occupying dwellings of only one apartment. Of these 296 removed to dwellings of the same size, and 138 to larger, while 25 gave up householding and took to lodgings, 1 removed to the suburbs, 9 to the country, and 9 are otherwise accounted for by emigration, imprisonment, the poorhouse, &c. We found 330 families occupying dwellings of two apartments. Of these 217 removed to dwellings of the same size, 34 to larger, and 68 to smaller; while 2 went into lodgings, 1 removed to the suburbs, and 1 to the country, leaving 7 to be otherwise accounted for. We found 62 families occupying dwellings of three apartments. Of these, 15 removed to houses of the same size, 8 to larger, and 33 to smaller; while 1 went to lodgings, 3 removed to the suburbs, and 1 to the country, leaving 1 to be otherwise accounted for. The remaining 28 families occupied dwellings larger than three apartments; and of these 3 removed to houses of the same size, 1 to a larger, and 23 to smaller, leaving 1 to be otherwise accounted for. The general result is that only 13 per cent. of the families displaced by our operations removed to smaller houses, even if we estimate the comparative size on the rough basis of the number of apartments; while 20 per cent. removed to larger.

In a sanitary aspect the meaning of the size of a house depends upon the relation between the *number of the family* and the capacity of the house. Applying this test also, the results are satisfactory. Both in May, 1874, and May, 1875, it was found that the average number of inmates in the houses of one apartment into which those families assorted themselves was decidedly less than in those which they had left; that in houses of two apartments, also, the average number was less, though not so decidedly; while in houses of three apartments and upwards the numbers were considerably greater. All this is just as it should be. The operations left the families displaced living in houses better adapted to their numerical requirements than those in which it found them.

This fact is all the more important and gratifying when we turn to the matter of *rental*, and observe that of all the changes forced upon those people, that of increased expenditure for house-rent was the most decided, and very probably to themselves the greatest and most obtrusive. For every class of house there was an increase of rent, amounting to 20 per cent. on the old rental of a one-apartment dwelling in 1874, and 17 per cent. in 1875; to 20 per cent. on the old rental of a two-apartment dwelling in 1874, and 21 per cent. in 1875. The purely fictitious nature of the accommodation provided in these wretched dilapidated properties is made glaringly manifest by the comparative rental of the houses above two apartments. To say that a dwelling of three or four apartments could only be got in the new localities at an increase of 50 to 58 per cent. over the rental of the same size dwelling in the old localities, is to misrepresent the case, and do an injustice to the honest landlord quite as great as would the quotation of the prices of the merchant of adulterated goods against those of the fair dealer. The same remark applies to the smaller houses, though not to the same extent. What would a house of one apartment be at 2s. 6d. or 3s. 6d. per month, or a house of two apartments at 5s. per month, or a house of three apartments at 5s. 10d. per month, or one of four apartments at

7s. 10d. or 8s. 6d. per month? Yet these are all quotations of rents actually paid. A house means something more than a hole. The burrow of a Bosjeman is not a house. But are there people in our large towns who can contribute no more monthly towards the provision of a dwelling place than such sums as these? If there be, then, for the public safety and for the sake of our civilisation, philanthropy or taxation must provide for such; but my experience does not lead me to believe in their existence, except as the product of vice and improvidence. I invariably observe that in such hovels you do not find those who are poor from necessity of circumstance, but those who live by unlawful callings or who divert from their families and their houses every possible penny, in order to spend it in self-indulgence. In 1865, in his Report to the Privy Council on the Housing of the Poor in Towns, Dr. Hunter said: "From one point of view, crowding in Glasgow means the diversion of income from rent to supply whisky." The same remark, I have no doubt, applies to the same class in all large towns.

Another item in the changed circumstances of those people which admits of numerical statement is the method of *excrement disposal*. In 1874 we found that only 4½ per cent. of the families displaced had water-closets, the remainder using ash-pits and privies. In their new abodes, 13½ per cent. were supplied with those conveniences. In 1875 the proportion was increased from 7 per cent. to 14 per cent. by the compulsory change. Here, again, we must recall your minds to the improved conditions which cannot be expressed by bald figures. The ashpits and privies of the new localities are much more inoffensive and innocuous than in the old, where, from want of space, they were close to the dwelling-houses, often at the bottom of enclosures, which were simply pits or tanks, in which the foul effluvia stagnated, and surrounded by windows through which they passed freely into the houses. In the new localities, also, in 1874, 63 per cent., and in 1875, 45 per cent. of the water-closets were situated, not in the houses, but on the common stair, indeed, but for this, I should hesitate to enumerate among the advantages of the change the fact that houses of this class were provided with water-closets. It is scarcely possible to find a position in a house of four or five apartments where a water-closet will not be a dangerous nuisance; and it is simply abominable to introduce such a thing into a house of three apartments or less. Apart from those objections on the ground of space and structure, there is this other of wider application, that a certain amount of culture and intelligence is necessary for the proper management of those social conveniences; and, wherever a water-closet is common property, as a rule it is abused; it is essentially suited only for the use of one family living in a self-contained house. In Glasgow, unfortunately, where we have proved that our Improvement Trust operations are increasing the proportion of our excretions which passes into the sewers, we have not seen the last of the nuisance. We are increasing the pollution of the Clyde beyond the increase proportioned to the growth of our population; but, after all, in relation to public health, it is a question of degree. On the one hand, we have the filthy ashpit or privy in our confined courts and yards; and, on the other, the filthy river flowing through a long open space, and exposed freely to the open air. Still, it is not a case of "How happy should we be with either," but how gladly would we part with both.

The last of the immediate and numerically measurable results of our demolitions is their effect in accomplishing the *dispersion of our population* more equally over the area of the city. We shall discuss the matter of density and its relations to health immediately; but meanwhile we shall assume that the expulsion of masses of the community from the centre outwards is at once to effect an improvement in their general hygienic position. We must go down into the city to earn our bread, but the nearer to the outer verge we can sleep and rear our families, the better in the aggregate.

The Cross may be taken as the centre of the city of Glasgow, being almost equi-distant from all points of the municipal boundary, and also the nucleus round which the city has grown—the oldest, most densely inhabited, and most unhealthy part of it. The general result of our investigations in 1874 was that before our operations only 27 per cent. of the families displaced lived beyond half a mile from the Cross, but that afterwards no less than 60 per cent. were dispersed to various stages beyond that distance, two per cent. flowing over into the suburbs. In 1875 we found that, as in the former year, before being distributed, only 27 per cent. lived outside a circle at half a mile radius from the Cross, but that afterwards 54 per cent. had settled down outside that circle, 1 per cent. having gone to the suburbs. In each year the crest of the wave of dispersion was at the three-quarter mile circle from the Cross. If we confine our attention solely to the families primarily displaced, the internal movement resembles that of a wave gathering up to a crest, then breaking and flowing outwards in a diminishing stream; but if we have regard to all the units of the population in whose midst this commotion takes place, we shall discover a process of displacement and substitution whose only limits are the very outer confines not merely of that which is artificially termed Glasgow, but of that great community of which Glasgow is the vital centre. Those people go into cast-off houses just as they wear cast-off clothes, and the demand is met by "making down" houses, converting one large into a cluster of small, a process to which I shall not allude further than to say that it is rapidly reproducing the evils to get rid of which we are expending so much money.

Such are all the facts capable of statistical expression which I can adduce concerning the sanitary results of the Glasgow Improvement Act. They are, you will observe, facts concerning the very people whom the operations of the Act immediately affect, and they are the immediate effects upon those people. As to the ulterior effects upon the health of those people, and upon the health of the general community, I am not yet able to speak. A necessary condition of all effects upon health is time. On general principles, we believe that all the changes to which I have given numerical expression are of a nature to benefit the citizens involved in those changes; but for the manifestation of those benefits, until they also admit of statistical expression, time for their development is absolutely essential. It seems to me that they have begun to show themselves, but it would be premature to appeal to figures in proof of our belief.

I may, however, allude shortly to other procedures under the Improvement Act which have been adopted in the direction of the amelioration of the unhealthy conditions of city life. The first of these is the provision of *common lodging-houses*. In the course of our investigations we found that between 3 and 4 per cent. of the families displaced went into lodgings. The keeping of lodgers is quite a feature of small householding in Glasgow, and a very unpleasant one it is, both in its social and its sanitary aspects. At the census of 1871, it was found that 23 per cent. of all the families kept lodgers, and the practice prevails among those who must necessarily sacrifice both decency and health in the exercise of it. Even of families living in one apartment, 14 per cent. had lodgers, and of those in two apartments, 27 per cent. As three-fourths precisely of all the dwellings in the town are of that size, you will understand what an important element in the community in every aspect is the unattached lodging population. To my mind the introduction of lodgers into the family circle of those small houses is to be regretted and discouraged. In a one-apartment house it is simply abominable to contemplate; and in all cases the close personal contact and the want of privacy either of the general or family functions which must prevail are made doubly injurious, morally, by the introduction of strangers, besides the physical injury of overcrowding. Of this lodgers are the frequent cause, being crammed into houses which, without them, would afford tolerably decent and wholesome accommodation to the natural inmates. Hence, as the Registrar-General for Scotland pointed out in his Report on the Census, "the larger house for the operative, built with a view of effecting the better separation of the sexes, is in reality found to have no such effect; but, on the other hand, holds out an inducement to him to crowd his family to a greater extent than when he occupies a house of one or two rooms" (vol. i. p. 35).

In destroying those fictitious houses, let at nominal rents, which I have described, the Improvement Trust were adding to that vagrant class of people who occupy common lodging-houses, and for them only did they of themselves provide accommodation in the shape of large lodging-houses, with day rooms, lavatories, and every convenience, where each has a separate bed, and the use of a cooking range and utensils, at the charge of 3½d. per night. They are each under a superintendent, and are kept in admirable order. They are self-supporting, and return 5 per cent. on the capital expended. From this we may have some idea how lucrative the lodging-houses provided by private enterprise must be.

PROVISION OF DWELLINGS FOR THE PEOPLE DISPLACED.

Now we come to the most important branch of all improvement schemes, the reconstruction, the *provision of dwellings for the people displaced*, and their supervision, so as to check the upgrowth of like errors of plan and occupation. In a memorandum addressed to Mr. Secretary Cross, and contained in papers presented to Parliament before the introduction of the Artizans' Dwellings Bill, the sub-convener of our Trust (Bailie Morrison) says—"We do not build houses, as a sufficient number of these are erected by private enterprise to meet all the wants, and no case of real hardship is known. . . . We are opposed to competing with private enterprise, as such a course checks building. Neither do we consider it prudent to become philanthropic landlords, to let houses below the actual rents to any class, as this has a decided tendency to pauperize and destroy that feeling of independence in our working-class population to which they are already too prone." I do not question the propriety of this decision, to leave the demands of a public necessity to the action of the ordinary law of supply on commercial principles; but it ought to be an essential condition of such a decision on the part of a local authority carrying out such operations, that they must have the power of impressing upon the new building of the present all the sanitary lessons of the past; that, in short, they should have a liberally constructed Building Act. This we unfortunately do not possess in Glasgow, as is sufficiently manifested by a resolution of the Committee of Health of date 18th January, 1875, to this effect : " The attention of the Committee having been directed to the evil effects resulting from the occupation of buildings of a certain construction, now being erected in different districts of the city, particularly tenements of dwelling-houses erected on what is known as the hollow-square system, the Committee remitted to a sub-committee of their number, along with the medical officer and master of works, as a special committee to examine these buildings relatively to the width of the adjoining streets, and open spaces inside of these squares, and to report what steps should be adopted by the Board in reference thereto."

I shall not occupy your time with any details of the defects in the powers of the local authority over new buildings, noted and reported by this committee. It is enough to state that they were numerous and most important, and that their labours resulted in the appointment of a deputation, which waited upon the Home Secretary and Lord Advocate, and strongly represented to the Government the necessity of statutory provision for the enforcement of a uniform system of building regulations in the cities and large towns of Scotland, and beyond the boundaries thereof, within a certain defined radius from the centres of such cities and towns, according to their population and area. The important lesson which I wish to impress upon your minds is this, that to enter upon any large scheme of demolition of the dense unhealthy areas of large towns, without first looking narrowly into the existing building regulations, is to adopt a course which necessitates extensive reconstruction and erection of new buildings, without a sufficient guarantee that they shall not, in any degree, reproduce the evils of the old, and, indeed, shall be in all respects the best that the most advanced sanitary requirements can demand. Let the example of Glasgow, therefore, be a warning to other communities. A full quarter of our total inhabited houses has been erected since 1866, when our Improvement Act was passed; and of that quarter, 93 per cent. were dwellings of one, two, or three apartments. Yet while we have enforced all the powers we possess of regulating those new buildings, and while they are undoubtedly improvements upon the old, we confess that we have let slip a golden opportunity of erecting a model city.

The operations to which I refer have enhanced enormously the value of property in the city, and of land suited for building purposes in its neighbourhood. The tendency of both is always upwards in the vicinity of towns; but the artificial stimulus of those extensive central clearances, and the outward pressure caused thereby have, in Glasgow, added to house property and land all at once a marketable value which in ordinary circumstances would have been the slow increment of years. In this way the great problem which presents itself at the very outset of any attempt to provide working-class houses on commercial principles has been rendered still more difficult of solution. I mean the value of land, the primary cost of sites for buildings, and the difficulty of so planning our buildings as to secure a sufficient return upon capital and yet not overbuild and overcrowd the soil. It seems to me that the question of the health of towns has now passed into the hands of the architect, the engineer, and the capitalist. Speaking, for the moment, in a representative sense, I do not feel called upon to be architect, and economist, and hygienist all in one. In the latter capacity I am prepared to lay down general principles, and to criticise and approve; and unless it be that architects cannot draw plans which will satisfy both the hygienist and the capitalist, I see no reason why I should be asked to do more. If you go out into the clear for your building ground, there is no doubt my demands will be more easily satisfied; but you must persuade the people to go thither; you must get manufacturers to transfer their factories, foundries, and workshops to the outskirts, where they would, in these days of private telegraphs and railways, be nearer the town counting-house than they were half a century ago: and you must facilitate the means of bodily transit between the town and the country.

If you desire to make a trial of the dearer city soil, then you will find my requirements more stringent, and my conditions more difficult to combine with profit. However the task of providing healthy houses is to be accomplished, I believe our knowledge of the conditions of health is sufficiently advanced, and our conviction of their practicability sufficiently clear, to warrant the Legislature to take the same position as in the case of trade nuisances, and say—These are our conditions, and you must comply with them. It was never intended that cities must either cease to grow or become huge sarcophagi, because architects and engineers could not satisfy the hygienist on the one hand and the capitalist on the other.

In addition to the area of which they became proprietors in the course of their operations, the Improvement Trust also purchased two small estates on the outskirts of the city, which they disposed of in the ordinary way for the erection of working-class houses. In drawing the building plans they availed themselves to some extent of their position, as superiors, to set aside free spaces, to control the arrangement of the building blocks, and otherwise to illustrate the power which the original holder of the land possesses of giving a healthy constitution, so to speak, to the new quarters of towns.

THE FLATTED TENEMENT IN MODEL DWELLING-HOUSES.

It is somewhat remarkable that, in the endeavour to work out this problem of house accommodation and high-priced land, you, in the south, are turning with favour to the flatted system of tenements, on which we in the north look with misgiving. It requires no great consideration or exercise of ingenuity to discover that the simplest way to solve the problem of dear lands is to build upwards into the air. Still you will readily understand that the public of Glasgow paying a yearly tax to disperse densities averaging 800 to the acre, convinced that they were building houses too tall, and packing them too closely together in districts which did not carry above a fourth of that number, and only just recovering from the alarm of a death-rate of 66 under the smothering blanket of the previous winter's fog, were startled in the spring of 1875, when news was brought to them from London, that people were being exhibited there, living in tall tenements like steeples, seven flats high, and 1600 to the acre. You may fancy with what eagerness and anxiety the officials and members of the Corporation seized the first chance of being in the metropolis to go and see this wondrous sight. I must add that when the Chairman of our Health Committee, our Master of Works, Dr. Gairdner, late Medical Officer of Health, and myself, looked upon these erections in Farringdon Road, we recognised too much of the features of the High Street and Saltmarket, to take readily to the belief that we saw before us a solution of the question of house accommodation for urban communities. Still, a rash inference or a misleading statement, uttered with authority, often gives much trouble to persons who are striving for a principle; and from the amount of attention which the above statement has attracted in Glasgow, it seems worth while to look narrowly into it. I wish also to add, that while reference is made to one set of model dwellings alone, I have various others in London, such as the Peabody, Corporation, Waterlow, &c., in my mind also, to which in different degrees the same criticisms apply, as in the case of the buildings specially quoted.

In February, 1875, Mr. Charles Gatliff, Secretary to the Metropolitan Association for Improving the Dwellings of the Industrial Classes, read a paper before the Statistical Society of London "On Improved Dwellings and their Beneficial Effect on Health and Morals, with Suggestions for their Extension." It is an extremely able, exhaustive, fair, and, on the whole, accurate statement of the facts as regards the dwellings of the Metropolitan Association, to which the flatted tenements in Farringdon Road belong. I am anxious that no adverse criticism which I may make shall be taken as depreciatory of Mr. Gatliff's services in compiling such a paper. The Association was incorporated by Royal Charter in 1845, the dividend being thereby limited to 5 per cent. as the maximum. It has provided accommodation for 4150 persons in flatted tenements in London, and for 1150 in cottages in the suburbs, to which gardens are attached.

The tenements are built in blocks from five to seven flats in height, standing vertical to the street. The cottages range in size from two to six rooms, and in rent from 5s. to 7s. 6d. per week. The dwellings in flats range in size from two to four rooms, and in rent from 4s. to 9s. 6d. per week. The average density of the inhabitants of those dwellings is 1140 to the acre. At one part of the paper the mortality is said during the last eight years not to have exceeded 14 per 1000; and I have seen this quoted repeatedly, although it is an error, as we find from Table IV. that it has ranged from 15 to 18 per 1000. The birth-rate was 36 per 1000. The death-rate of all London in the same time averaged 24, and the birth-rate was 34½. The financial results are, that for 1875, the maximum dividend of 5 per cent. was paid, and for the five previous years 4½. Mr. Gatliff puts forward, as the leading advantages of the metropolitan dwellings, decreased mortality and disease; less area occupied and greater number of persons provided for, notwithstanding large space for recreation and ventilation; the facilities for the detection and suppression of crime.

There are various minor criticisms which occur to me upon this paper, which I may rapidly mention before proceeding to the main question of principle involved. The average death-rate of those model dwellings in eight years is 16 per 1000, calculated from Mr. Gatliff's data; but you will observe these are derived from all the buildings, urban and suburban, making twelve widely scattered groups of persons. It is eminently unsatisfactory to test such a system of building as the flatted tenement, by including with its statistics those of self-contained cottages with gardens, which everyone admits must be a sanitary Arcadia. After all, we have no assurance that all the deaths fairly referable to those tenements are included. In the discussion at the Statistical Society a member "begged to submit that the death-rate was entirely fallacious, inasmuch as a considerable number of the inmates of these model lodging-houses died in the hospital." I put this by letter to Mr. Gatliff, and find that this has not been inquired into; but he argues that his tenants are less likely to go to hospital than those of inferior property in London, and that therefore his death-rate, if not absolutely correct, is sufficiently so for comparative purposes. It is a pity that, in a paper on which so much labour has been spent, a flaw so serious should exist. Isolated blocks of buildings, standing in districts widely separated, cannot be compared with districts, unless this matter of hospital deaths has been settled. The district generally contains a hospital and a workhouse; and the block of building, whether it retains all its cases of sickness or parts with a few to an institution, has an obvious unfair advantage. This is altogether apart from fundamental objections to such a test of mortality or comparison in any respect subsequently to be taken. Another circumstance to be discounted from the value of Mr. Gatliff's death-rates is the process of selection of the population from which they are derived. In his own words, "the inmates of these model houses always undergo a twofold process of selection; that is to say, the inmates first select the model lodging-houses as harmonizing with their own decent tastes, and are then chosen from a larger list of applicants, according to the discretion of the managers of these institutions." In short, the inmates as well as the houses are models; and from this assorted population we are asked to make inferences applicable to the mass of a city population, or rather to the residuum who are cast aside in this process of selection, and in whose ranks we shall find the very people who are the source of our perplexity, and for whom we are most anxious to provide. They have not the senses requisite for the discovery of the comforts of such dwellings, but the possession of which leads the skilled workman, the clerk, and the warehouseman towards the exotic circumstances of the model dwelling-houses, where, in the words of a valuable Report of the London Charity Organisation Society, "philanthropic" agency supplies one of the chief necessaries of life—viz. lodging—below its market value. Mr. Gatliff gives the occupations of his tenants. I find among the tenants of the flatted tenements only 5 per cent. designated as "labourers," and 2½ per cent. as "charwomen"; the remainder are tradesmen and other persons who under any circumstances, at any rate, in Glasgow, would have provided themselves, without the aid of an association, with the best article in the way of house accommodation to be had, at its full market value. There is yet another circumstance in the way of discount to be mentioned, and that is the supervision and discipline to which this model population is constantly subjected. Again, to quote Mr. Gatliff, "at each of these establishments a superintendent resides to collect rents, supervise, and make himself generally useful; and there is a labourer to execute repairs, also residing on the premises. These men, in performing their duties, become acquainted with the tenants, their occupations and pursuits, and soon detect drunkards, brawlers, prostitutes, receivers of stolen goods, or other bad characters, who occasionally resort to improved dwellings to evade suspicion." I only ask you to consider what influence on the health as well as the morals of almost any sort of property would be exercised if the landlords set themselves to eliminate "all drunkards, brawlers, prostitutes, receivers of stolen goods, or other bad characters."

But the point to which I wish most particularly to direct your attention is the imperfect and fallacious ideas of density which pervade Mr. Gatliff's paper and underlie his inferences; for example, in such a passage as this: When we consider the diminished rates of mortality and disease which accrue to the tenants in them, notwithstanding that the average population is at least four times more to the acre than in the most densely populated parts of the metropolis, we have an irresistible argument in favour of the increase and extension of this class of buildings. In Westminster, which is the most densely populated part of the metropolis, the population is only 235 persons to the acre; whereas in the dwellings provided by the Metropolitan Association, including in the areas the large court-yards and gardens attached, the average is 1140 to the acre; and yet the rates of mortality and disease are at the low figures just stated." In a foot-note it is added, "In one instance (that of the Farringdon Road Buildings) the population is 1625 to the acre."

THE DOCTRINE OF DENSITY IN RELATION TO HEALTH.

It will be necessary for us to endeavour to form some clear conception of the doctrine of density in relation to mortality. It is not necessary now-a-days to prove that there is such a relation. From the date of the publication of the first of Dr. Farr's annual "Letters to the Registrar-General" appended to the Report for 1838, the fact has received yearly accession of proof and illustration. In the fifth Report, on the basis of four years, Dr. Farr showed that the relation was so exact that it could be formulated thus. The mortality of two places is as the sixth root of their densities; and the mortality, calculated from this formula for certain districts during those years, is shown to be identical with the actual mortality. This rule, however, has not been found to apply to the decennial statistics of 1841-50, 1851-60, and 1861-70; but in each period the law prevails, that "there is a constant increase of mortality running parallel with the increase of density." The fact of density may be expressed in various ways; as persons to a certain unit of superficial area, *e.g.*, square miles or acres; or as so many units of superficial area to a person; or both modes of expression may be combined in the proximity, which is as the square root of the density. But this is a mere matter of terminology. What we wish to ascertain is this: What is the essence of this relation between density and death-rate? What is the fact in Nature involved therein? and what is the broadest expression we can give to it? It seems to me to be the numerical expression of the fact that there are limits to the self-purifying powers of Nature; that the laws of Nature, to which we trust for the purification of earth and air and water from the contaminations of animal life, are effective under certain conditions, with which aggregation interferes when it exceeds a certain proportion to the area occupied. The oxygenating powers of the ground-air are overmastered; the ground-water becomes impregnated with unreduced organic matter; the rivers are loaded with impurities; the cycle of interchange and cooperation of the animal and vegetable kingdoms is interrupted; the action of the law of diffusion in the atmosphere, and the influence of light and heat in promoting chemical change and mechanical mixture and dispersion, are crippled. These propositions are, theoretically, simple expressions of fact; but in various ways, when we come practically to illustrate their meaning, they become involved with so many modifying variables, that it is only by supposing simple cases, and introducing synthetically these variables, we can, as it were, build up before our minds the conditions under which we find populations living, and show through them all the operation of one law. This is the secret of the failure of Farr's law, that the mortality of two places is as the sixth root of their densities. We can modify the influence of density by certain sanitary expedients. Let us imagine a community or a series of districts with a density unchanged for a decade; the population stereotyped in their occupations, character, proportion of ages and sexes, &c.; but advancing in their understanding by those laws of Nature which govern the action of density. By drainage they will lower the level of the ground-water, increase the proportion of ground air, and so increase the power of the earth to cope with impurities. By sewerage they will convey to a distance their local filth, and so diminish the impurity with which the soil has to deal. They can make themselves entirely free of all local influences of the ground-water by leading into their midst a domestic water supply from a distant source. Air they cannot directly bring from a distance, but it will be purified to some extent by the same means which promote purity of earth and water, and still more by restoring as far as possible those conditions under which pneumatic laws obtain the freest scope, by removing mechanical obstructions to diffusion, to the access of light and the free play of winds, and by calling in the aid of vegetation. Suppose all this done, and we have a series of districts with their density unchanged but with their mortality diminished. If all the districts have made equal sanitary progress, the same relation of density and mortality will be apparent; but if they have advanced unequally, then this relation will be entirely overthrown. A case of the very opposite of this may be imagined, in which a series of districts may be stagnant as regards every condition of their existence saving their density. They may spread themselves out to the density of rural districts, or rather in that direction; and the more nearly they approach that degree of tenuity of population, the more will their death-rate approach the rural standard. Yet another case may be supposed, in which while the density and the general sanitary expedients are the same, the character of the population, their occupations, proportion of ages and sexes, &c., are revolutionized, and individual effort in the combat of circumstances is introduced. In that case we should again have a lower death-rate, apparently inconsistent with this great law of density, but in fact proving this, that the same degree of aggregation is more destructive of one class of people than of another; that the habits of some people sooner than those of others break the laws on the observance of which a certain degree of health may be had—laws which become more exacting with every increase of density.

It will be apparent from these synthetic illustrations that, in studying the influence of density as we find it, we must remember the infinitely variable combination of circumstances in and through which it acts, and prepare to meet inconsistencies, which will disappear only after a careful analysis of these circumstances. But of this we may rest assured. that, whenever two communities are absolutely comparable in all respects save of the density or proximity to their vital units, the more dense will be the more unhealthy, above that, as yet, undetermined limit at which the element of density becomes measurable as a factor; and if two communities be of like density, but differ in health, then we shall find in the one circumstances which intensify the morbid influences of density, or in the other circumstances which compensate and neutralize them. Here, then, we are introduced to the practical aspect of the doctrine of density. Concentration of vital units is one of the features of civilization, and an essential condition of its highest development. The point to be determined in this concentration is, that where the maximum of common advantage is reached, and where deterioration and morbid influences begin to exceed; and that nation will reach the highest level and, what is still more important, longest maintain its place there, which succeeds in discovering and preserving the maximum of concentration consistent with the minimum of deterioration.

We can now return to the Metropolitan Association. In the passage which I quoted Mr. Gatliff contrasts the density and mortality of Westminster with what he calls the density and mortality of his dwellings. In the former we have 235 persons per acre, and a mortality of 23 per 1000 (the average of the decade 1851-60, for Westminster registration district); in the latter we have 1140 per acre, and a mortality of 16 per 1000—nay, we have even 1600 per acre in one building, and yet, see what material advantages remain. The question of whether 16 is or is not the mortality is of little moment. We have at present to ask, is this a logical comparison? And I have to answer that it is not. An essential condition of the notion of density, and an element which enters into its very definition as a law, is not the rate, but the area over which the rate prevails; and that area must be a continuous area, not formed of patches only brought together upon paper for statistical purposes. But Mr. Gatliff takes bits of land dotted all over the metropolis, with the flatted tenements thereon, and his cottages in the country, with their gardens; adds together their area and population, finds that the proportion is 1140 to the acre, calls it their density, and then contrasts this with the density of between two and three hundred continuous acres in Westminster, and, by implication, with all that we know of the relation of density and death-rate, as illustrated in three decades of the Registrar-General's Returns, derived from square miles of country, urban and rural. Could anything be more fallacious? The fact is, the density of those buildings and cottages is simply that of the district in which they stand, if taken individually; and, if collectively, that of the metropolis as a whole, viz., 45 per acre. If you have 800 people living on half an acre of ground in the middle of Hyde Park, that does not mean that they are living at a density of 1600 per acre; they are living upon the bounty of the surrounding acres. If such a block of buildings were transported into the midst of a semi-asphyxiated city, such as Glasgow, where every patch of soil has already been utilised, and the general stock of air is poor, the death-rate would soon adjust itself to the actual density. In short, we may be sure that, while the seven-flatted tenement carrying 1600 per acre of the area of its own site, may be a satisfactory solution of the difficulty of ground rent and cheap house accommodation, between the architect and the individual capitalist who holds the ground or builds the tenements, it would be ruinous for the health of the community if applied to a large area, and intolerable unless the Government or the local authority provided lungs in the shape of free space, on the bounty of which the tenants would live.

A few minutes ago I referred to Glasgow as a "semi-asphyxiated city," and I used the term with deliberation, as I believe that it is on the quality of the air that density of population most certainly tells. The influences on earth and water may be combated and diminished with comparative ease; but it is to a great degree inevitable that, except in so far as purity of air and water lessen the impurity of the air, density must carry with it aerial contamination. In cities we have a conjunction of circumstances, all which co-operate to throw an excess of impurity into the air, and also of circumstances which obstruct and impair the natural arrangements for the reduction of those impurities. Just let me give a few details of my own city relative to this matter. What is called Glasgow, and for municipal and statistical purposes is embraced under the name, occupies an area of 6033 acres, of which, we may say, 1000 are unbuilt upon, but available for building; while 282 are devoted to public parks, and 137 are graveyards, of which 120 are still in daily use. On the remaining 4614 acres there were congregated, in 1875, 534,560 human beings, of whom three-fourths lived in dwellings of one and two apartments; 8200 horses in 2300 stalls; 1770 cows in 300 cow-houses; 1370 pigs in 140 piggeries. Each of these collections of animals has its attached heap of manure or refuse; the human animals having 7000 ashpits, or ashpits and privies with pans, the superficial area of which, at a moderate computation, will be 4¼ acres, and probably a third of this area is covered with a mixture of night-soil and ashes or night-soil alone. The emanations of this area are more injurious than if it were really continuous, as these ashpits and privies are all situated in confined courts, or inside those hollow blocks in which the Glasgow tenements are always built. Add to this the products of combustion of coal, poured out from hundreds of factory chimneys and thousands of domestic vents, and of some sixteen hundred million cubic feet of gas which is consumed, besides three million cubic feet which leaks into the soil. Then look at the hindrances thrown in the way of nature by our block-buildings, which are so many boxes of stagnant air; by our back buildings standing inside those boxes, by our narrow streets and tall tenements; and at the subversion of the cycle of nature by the abolition of vegetation, partly through our avarice of the soil, which will not leave a yard to its natural uses if possible; partly through the impurity of our atmosphere, which kills all trees, and in some places even grass, so that the influence of Glasgow is like that of a flight of locusts, it leaves not a green thing behind.

Can it be a matter of surprise that bronchitis, consumption, and other diseases of the lungs constitute, year by year, from 31 to 38 per cent. of our entire mortality? The same fatal prevalence of pulmonary disease attends all urban communities, more or less; and when the sources of mortality are compared with the density of large areas over decades, it is found that they show characteristics consistent with, and proportioned to, density. Sometimes this tendency to asphyxia in our large cities is brought out in an appalling manner by passing physical changes, which temporarily intensify all those obstacles to the purifying efforts of nature which we have enumerated. Such are the effects of combined cold and fog, of the influence of which an illustration was furnished in London in December, 1873, when the death-rate was pushed up to 38, and the cattle in the Christmas Show at the Agricultural Hall died in great numbers, manifestly choked. But more shocking was our own case, in December, 1874, when, during a ten days' continuous fog, ending on the 31st of that month, the death-rate of Glasgow reached the unprecedented point of 69 per 1000 in the week ending January 2nd—this rate being calculated from the date of death, and not merely from that of registration, which at such a season may be unduly deferred. And what were the causes of those deaths? Of the total 700 no fewer than 372 were pulmonary; only 107 were zymotic, and the remaining 221 were from other general causes. Hence, simply by drawing the curtain of the fog over a city during a time of intense frost, it is possible, under those circumstances of constantly impaired aeration of its organic effluvia, to well-nigh stifle it, and cause a mortality to which zymotic disease contributes comparatively nothing; and which, indeed, it seldom occasions under such degrees of prevalence of pestilence as are known in modern times in the temperate zone.

EFFECTS OF DENSITY ON THE COMPOSITION OF THE AIR.

We are thus led up to the consideration of an exact measurement of density as a factor in relation to health. The simple numerical statement is subject to so many modifications by association with varying conditions in the other circumstances of the vital units, that it is very desirable to obtain some compendious exact expression of the meaning of density in each case. This would probably be afforded by analysis of the air. So far as density of population is a factor of disease, it must have a corresponding density of air, and thus the chemist could detect, where, under given circumstances, we pass from a degree of density consistent with health in those circumstances to one productive of disease. This idea was floating in the mind of Dr. Farr in 1843; but he says, at that date, "chemists have hitherto failed to detect any excess of carbonic acid in cities," a statement which, though not historically correct, inasmuch as the younger De Saussure had, in 1827, clearly established a difference between the air of Geneva and of the fields outside that town, is indicative of the position of chemical analysis as practically applicable to the solution of the hygienic relations of the air. I need not remind you that, through the laborious investigations of Dr. Angus Smith, the most important of which were expended upon the air of the neighbouring city of Manchester, the outlines of the chemical climatology of cities have been clearly drawn, and the chief difficulties of method have been overcome. When we recollect the special provision made by the laws of diffusion of gases for the dispersion of carbonic acid, we can estimate the importance of the establishment of the presence in excess of that gas in the atmosphere of cities. It prepares us to expect the presence also of foreign ingredients in the shape of solid particles of animal life and other matter, which, unaided by pneumatic laws, depend for their dispersion upon mechanical transport by the fluid medium in which they are suspended. It is to this atmospheric dust, and the products of that portion which is organic, that modern pathology leads us to attach most importance, and also that modern chemical processes have made most advance in their power of estimating. The mechanical obstacles to the effective operation of the laws of diffusion which accompany density of population, tend to the accumulation in the lowest atmospheric strata in which we live of a microscopic sediment, which is both mechanically injurious to life and productive of chemical deterioration in the quality of the vital air.

I have long thought that the most important aid which chemical science could furnish to public health would consist in the systematic publication of analytic reports on the quality of the air we breathe, similar to those which are habitually furnished of the water we drink. It is not so very long ago since we became familiarized with the fact that water differs in its intimate composition to a degree beyond the powers of our finest senses to detect; and the greatest possible advance in our exact knowledge of the conditions of health would follow a like familiarity with the fact that chemical analysis can weigh and measure degrees of difference in air which are totally inappreciable by unaided sense. Angus Smith says—"It was a great day for the world when air was found to be something material, and to be capable of weighing down the scales of a balance"; but what he says in the previous sentence—"when we are children air is nothing"—is nevertheless true of the ordinary thoughts and conceptions of air current in the minds of the general public, whose intelligence is really the measure of sanitary progress.

It is not what Angus Smith teaches, but what our mayors and aldermen, provosts and magistrates believe, and have some rough practical apprehension of, that will sustain and give effect to a medical officer's denunciation of overflowing middens, building in hollow squares, narrow streets, unconsumed smoke, and other details which contribute to the great sum of aerial deterioration.

A short while ago, at my suggestion, the Health Committee of Glasgow resolved to give some assistance in the analysis of the air, in the healthy and unhealthy parts of the town, to Mr. Dixon, a gentleman who placed his personal services at our disposal without fee or reward. He has expended much time, ingenuity, and skill in devising an apparatus for the collection of the impurities of a large quantity of air in a short space of time. Even if it were prudent, at this stage, to enter upon any description of his arrangements, or account of his analytic processes, I should only spoil an interesting subject through lack of chemical knowledge. Mr. Dixon will probably be in a position to make some provisional communication on the subject at the meeting of the British Association in Glasgow in September next. The quality of their air is well worth the attention of all large towns. The chemist seems now quite able to cope with all the most important foreign ingredients, as well as with the minute variations in the proportion of its normal constituents. What he requires is such aid as public funds alone can provide. We may shortly expect some interesting and valuable results from the city of Paris, which, in April last, resolved to devote an annual sum of 12,000 francs for meteorological observations in various districts of the city. They are to be carried out under M. Marie-Davy, director of the Observatory of Montsouris, on the outskirts of Paris, and, besides the ordinary facts of meteorology, are to include atmospheric electricity and the comparative composition of the air. Before receiving this commission from the municipality of Paris, M. Marie-Davy had been gradually introducing air-analysis into the routine work of the observatory, both directly by automatic continuous air-washings, and indirectly, by the analysis of the rain-water. The special design of those investigations was to contribute to the scientific knowledge of agriculture; but now, in their extension to numerous stations in Paris, they cannot but yield results of importance to a scientific knowledge of hygiene. Since 1865, indeed, ozone estimations have been continuously made at twenty different stations in that city, of the results of which M. Marie-Davy gives a diagrammatic summary in the monthly report of his observatory for May last. From this it appears that, while ozone abounds towards the periphery and in the open parts of Paris, it is present only as a trace in the denser central quarters. The fact of the recognizable presence of ozone, even in the populous parts, is something to boast of. The contents of the Montsouris monthly reports are very interesting. Much attention is being given to the photographic delineation of the microscopic particles of the atmosphere, as well as to the products of culture experiments with the living organic portion; and it looks like progress in the right direction to find a systematic table of " Matters contained in the air and rain " of each month, showing opposite each day, for the period of the day and the night, the proportion in 100 cubic *metres* of air. of ozone, carbonic acid, ammonia, nitric acid, and organic matter, and per litre of rain-water, of ammonia, nitric acid, saline residue, and organic matter. Similar systematic information, collected at different points in the same city, will soon supply a solid structure of fact regarding its comparative hygienic conditions. The next step in the use of air-analysis will be as evidence in the enforcement of sanitary work, in matters of ventilation, defective structure, and nuisance removal, which at present are decided on the evidence of the senses or of experts, authorities which may differ. We have only to imagine that, to prove the impurity of the water of a well sunk in the neighbourhood of a cess-pit, we were deprived of the assistance of chemistry, to understand how great is the want of this assistance in the parallel case of air in alleged pollution from whatever cause.

Now, gentlemen, I have taken you over a considerable range of subjects, beginning with the endeavours of the authorities of Glasgow to improve the condition of their poorer citizens, passing through a discussion of the doctrine of density in relation to health, and ending with a reference to the important information to be anticipated from systematic air-analysis in crowded districts, as a key to the real truth in nature expressed by this doctrine of density. Laws of wide action may be lost sight of by the very scope of their influence; and if I have succeeded in convincing you that, however we may modify the effects of density upon health, they still exist, and are measurable in comparable circumstances, then the design of my remarks has been attained.

CHAPTER VI.

THE SOCIOLOGICAL ASPECTS OF SANITATION.

THE following pamphlets are here included :

1. The House.
2. The House in relation to Public Health.
3. Life in One Room.
4. Ticketed Houses.
5. Uninhabitable Houses.
6. Common Lodging-houses.
7. Sociological Aspects of Sanitation.
8. Sanitation and Social Economics.
9. Public Health and Social Problems.
10. The Children of the City : what can we do for them?

These papers, although delivered at separate times, and before different audiences, form, in reality, a continuous study of the defects of the social organism which militate against the health of the individual, and the well-being of the community.

At the time of their issue they stood almost alone in the wealth of detail which they supplied to legislator and social reformer alike, and scarcely anywhere else—within the limits of a single community at least—have the difficulties which beset the life of the poor in cities been the subject of so much patient inquiry and sympathetic description.

They begin with a simple dissertation on house structure and environment in relation to the requirements of healthy living, but the subject expands in the author's treatment of it, until the house becomes the index to the character of its occupant, and the ticketed house, the uninhabitable house, the house of one room, reflect not only grades in social condition, but degrees of moral abasement. In the paper on "Sanitation and Social Economics" in particular, the vital and social features of the worst of the old City Districts (Bridgegate and Wynds) are followed with a remorseless appeal to facts, which reveals, with an almost Zolaesque vividness, the hopeless abyss into which whole sections of a population may be plunged by continued indifference to their physical surroundings.

A few notes may serve to indicate the contents of the more important papers.

The House.—This, as has been said, deals entirely with structure and environment in relation to healthy living.

The House in relation to Public Health.—It is shown that uncontrolled aggregations of population vitiate the physical requirements of healthy living by producing impurity in air, soil, and water.

Illustrations are given to show that this becomes an appreciable factor in the death-rate, from which arises the fact that the aim of sanitation should be to minimise aggregation itself as well as the evils resulting from it.

This leads to a consideration of the part played by the house in relation to public health, and it is shown that the death-rates of different communities vary inversely as the average size of their houses.

What is true of cities generally can be shown to be true of districts of cities, and Blythswood and Kelvinhaugh are cited as districts having the largest proportion of large houses and the lowest death-rates, while Bridgegate and the Wynds have the largest proportion of small houses and the highest death-rates.

Carrying the analysis further into the number of inmates, it is shown, by an appeal to the census returns, that from the average number of persons per room and of rooms per average house, a standard of occupancy may be deduced, which may be expressed thus—the smaller the house as measured by rooms, the greater is the number of inmates per room.

On a basis of actual measurements, it is further shown that the smaller the house, the less cubic space there is per inmate.

The general conditions required to provide wholesome conditions in tenements and small houses are then considered, and the need for Building Regulations to ensure their provisions is pointed out. (Many of these have been supplied by subsequent legislation.)

Life in One Room.—The physical surroundings of the poor are here made the basis of a powerful appeal for aid to schemes of District Nursing, Day Nurseries, Poor Children's Dinner Table Funds, Fresh-Air Fortnight Funds, and the like. Aggregation or density of population reaches its most disastrous and most dangerous incidence in houses of one apartment. In the "Physics of Morality" the child is largely the product of his surroundings, and the gutter-child tends to become the loafer of later years. For all this each of us has a direct responsibility. It is shown that 25 per cent. of the inhabitants of Glasgow at that period lived in houses of one apartment, and only 8 per cent. in houses of 5 apartments and upwards; and that 14 per cent. of the one-room houses and 27 per cent. of the two-room houses contained lodgers.

One-third of the infantile deaths occur in houses of this size, and only 2 per cent. in the houses of five apartments and upwards.

Ticketed Houses.—The pamphlet on ticketed houses is an inquiry into the kind of house which becomes "ticketed" and into the character of the tenant who occupies it.

The relation between the death-rates of towns and the average size of their houses is shown by reference to Aberdeen, Leith, Perth, and Edinburgh, which, with houses averaging from three to five rooms, have death-rates below 24 per 1,000; and to Dundee, Greenock, Paisley, and Glasgow, where the average house has less than three rooms, and the death-rates exceed 25 per 1,000.

The same relationship is demonstrated in the districts of Glasgow. Blythswood having the largest and most thinly peopled houses, has the lowest death-rate; Bridgegate and Wynds, with the smallest and most crowded houses, has the highest death-rate.

The relation between rental and death-rate is considered, but is shown to be less constant, the question being, indeed, not so much the sum paid in rent as the cubic space which it procures. This forms the best basis for investigating mortality in relation to size of house.

The inquiry is continued into the causes of death in the several classes of house, and using the largest houses as unity, the death-rate from Zymotic diseases in the medium-sized houses can be stated at 2, and in the smallest as 4. Similarly lung diseases are represented by 2 in the medium-sized houses, and 3 in the smallest; while the diseases of nutrition special to child life were 2½ in the medium-sized houses, and 5 in the smallest houses.

While it is admitted that the secret of the health of Glasgow lies within the one and two-room houses, the fact remains that between districts presenting the same proportion of these houses, the death-rate may vary from 23 (St. Rollox) to 42 (Bridgegate). St. Rollox has 83 per cent. smaller sized houses, and Bridgegate and Wynds 84 per cent. of one and two apartments; and the question is asked—Is this difference due to house, or to people, or to both?

This leads to a recognition of the fact that ticketed houses form a distinct class within the general body of the one and two-room houses.

It is pointed out that, almost without exception, ticketed houses are made-down houses. There are defects in ventilation and light. Internally, the average air space per inmate is examined, and it is shown that the ticketed house is small of its kind to begin with, and owes its ticket to the constant disposition of its occupants to overcrowd.

A comparison is established between the rent and air space in ticketed houses and model buildings, and it is shown that in both the tenant of the two-apartment house has better value for his money than the tenant of the one-apartment house.

The question is now asked, whether this relative increase in the cost for smaller quantities of house room results solely from the operation of an economic law, or whether other factors come into operation.

The 75,000 inmates of ticketed houses comprise not only the criminal class, but the social debris of the city. Some struggle with poverty, many more are bankrupt, both in character and fortune. Frequent changes occur, and the tenant of a ticketed house pays interest, not only on his poverty, but on his character.

He is undesirable as a tenant, and the question is asked, how this class is to be dealt with? The erection of Model Buildings brings no advantage to them, because they cannot be accepted as suitable tenants. This leads to a consideration of the duty of Public Authorities and of the community in a private capacity. Reformers should exercise all the power they can get to improve dwellings. The "making-down" of houses should be controlled, and a more summary method of dealing with unwholesome houses devised.

The paper closes with a reference to the work of Miss Octavia Hill.

Uninhabitable Houses.—Having in previous papers dealt with one-room houses and ticketed houses, the uninhabitable house here comes up for consideration.

It is asked why they are uninhabitable, and the answer is found in the fact that they are ticketed, structurally defective, and always small. A comparison of rental per cubic space established between Model buildings, ticketed house, and uninhabitable houses shows that the Uninhabitable house is cheap because it is nasty.

In considering who occupy uninhabitable houses, it is found that their tenants, for the most part, are nomadic in their habits. Half have an occupancy of less than a year, almost one-sixth, of less than a month. In addition, 36 per cent. of the houses are farmed out for the night, at 6d. or 8d. to "uninhabitable casuals."

But there are exceptions who preserve a high standard of decent living amidst much moral decay. These are chiefly the remnants of a former population, whom business necessity compels to remain.

Only one-half of the owners of uninhabitable houses are individuals.

Some Sociological Aspects of Sanitation.—Mr. Spencer's dictum that "every man has freedom to do all that he wills, provided he infringes not the equal freedom of any other man" is reviewed, and while general agreement with the principle is expressed, objection is taken to some of its applications to questions of public health. In illustration it is shown that disease—generally considered—does not always kill, but may only maim, and so produce a contrary result to that which the "extinction of the unfit" would seem to imply. Moreover, certain diseases descend vertically, that is, they are hereditary, while others spread laterally in virtue of being infectious. In the one case posterity may be affected—while epidemics do not always "weed out those of lowest development."

These latter have also the property of becoming endemic when conditions are favourable; this usually means unwholesome surroundings; and the conditions which favour endemic disease aggravate some and may cause others which are not of an infectious character. Dirt, in fact, implies disease, and the question, "What am I to do with my dirty neighbour?" affords an opportunity of considering the necessity of co-operation where individual effort is impossible—of balancing rates against improved health—of insisting on the administrative principle that compulsory education of the unwilling is the first step towards reclaiming him.

Sanitation and Social Economics: An Object Lesson.—District 14 (Bridgegate and Wynds) is selected because it is the worst district in respect of physical conditions, and associated vital and social characteristics. Half its houses are ticketed, and little less than half the Common Lodging-houses of the City are contained in it. Its deaths exceed its births in number. Twenty-five per cent. of its births are illegitimate, and 24 per cent. of the infants born die in their first year. Nineteen per cent. of its deaths are uncertified, *i.e.*, have no medical care, and the proportion enrolled in Friendly Societies is much below that of good working-class districts. Twenty-nine per cent. of its deaths occur in Public Institutions; 25.4 per cent. in rate-aided Institutions (City Poorhouse, Belvidere, North Prison, Central Police Office); and 4 per cent. in charitable Institutions (Royal Infirmary, Western Infirmary, Maternity Hospital). Thirty-seven per cent. of the burials carried out at the cost of the ratepayers, either by the Parochial Board or the Sanitary Department, were from District 14. Of the children born—10 per cent. were in rate-aided or charitable

Institutions (Maternity Hospital and City Poorhouse). Many others were attended by the out-door staff of the Maternity Hospital. In all, 55 per cent. of the children born in District 14 were born by the help of charity or the rates, as against 25 per cent. in the whole City.

Vaccination.—Approximately, 50 per cent. are vaccinated at Institutions supported by the rates or by charity.

Demands on the Service of the Corporation Departments.—Of the 16,000 odd visits made by the Sanitary Offices throughout the whole city in one year, 7000 were made in District 14 alone. Large contingents of its children go to Industrial Schools, Infirmaries, Day-feeding Schools, Orphan Homes, Free Breakfast Tables. The Police and Cleansing Departments are largely occupied therein, and parochial officers are never out of it.

The argument is then carried to the credit side of the account by considering the proportion of rates unpaid in this District.

The differing incidence of *rating* on rentals below and above £10 would, even on the assumption that everybody paid rates, leave the occupiers of subjects over £10 with a disproportionate share when compared with the lower rated occupiers, such as inhabit District 14. But of rates levied on rentals of £10 and upwards, only 2.6 per cent. are unpaid; while on rentals between £4 and £10, 20.46 per cent. are unpaid; and rentals of £4 and under are not assessed.

Poor and School Rates are levied on 80 per cent. of all rentals, half on owner and half on occupier, and here again all levied on rents above £10 are paid; but 28.5 per cent. of those levied on rents under £10 are unpaid.

A suggestive parallel is then drawn between the number of householders under £10 who fail to pay poor rates and of occupiers under £10 who either fail to pay police rates or on whom no rates are levied, and the number of ticketed houses. A further comparison of persons relieved by the City Parish from the payment of rates because of poverty, and exonerated by the City Police Authorities from payment of Police Rates, suggests that the 24,000 householders are comprised of 5000 honest and 19,000 fraudulent poor. It is also shown that the rental of premises in District 14 which are licensed for the sale of drink is equal to the rental of premises for the sale of food.

The question is asked, Does it pay to have such houses and such people in the City? Can a cordon be drawn round them, and recruiting prevented? At present they lead a wholly parasitic life, and the first remedial measure is to get rid of the unwholesome tenements which attract them. It is untrue to suggest that there is need for such places for these people.

The impossibility is suggested of building houses to accommodate them. It is not want of money so much as want of restraint in the use of it which keeps these people in their present position.

Public Health and Social Problems.—Urbanisation of populations a characteristic of the nineteenth century. In 1901, 69.77 per cent. of the population of Scotland, and 77 per cent. of the population of England and Wales were living under urban conditions. Aggregation determines urgency in social problems, and it is the function of Public Health to reduce the dangers of such. Fall in urban death-rates follows; and, when the physical basis of life is sounder, social burdens, poor rates, &c., all tend to lighten. A healthy city is a cheaper city than an unhealthy one, and most of the aims of the social reformer can be reached through administrative hygiene.

The Children of the City: What can we do for them?—Early efforts to restrict Growth of Cities were for political rather than hygienic reasons. Growth in Nineteenth Century, England and Scotland; Comparative Composition of Population in Town and Country; the Nativity of City Populations; Waste of Child Life in Cities, and deteriorated physique of survivors; city life quickens the natural impuses, so that if there is more moral earnestness and more intense religious life there is also more crime and more self-indulgence. Child life in the croft and in the wynd compared. The city child suffers from lack of space for his energies. Hence the need for Holiday Colonies, Physical Recreation Societies—above all, the provision of space near their homes for the younger children.—(Ed.)

THE HOUSE.[1]

What I have to speak about to-night is "The House" in a city. There are in this city of Glasgow above 119,000 houses, and the question presented from time to time to every householder is—Which of them shall I select as my residence? Necessarily the first element in the practical solution of such a question is—What can I afford to pay for this primary necessity of life, "a covert from the storm and rain?" But different men will answer this question differently, and the difference will depend on the degree of importance which a man attaches to the quality of his house as an element in the attainment of his standard of life. One man will say—My own health and happiness, the comfort and morality of my family, are involved in the answer: I must be satisfied with a shabby coat, I must deny myself luxuries, I must live on the plainest of food—so be it that it is wholesome; but above all things, I must have a house of such dimensions, and in such a situation, as will secure to me, and to those depending upon me, the physical conditions of health, so far as these depend upon the size and surroundings of my house. I must live where the sun can look in upon me, where the purest air the city affords will have access to me, where my children can get space in which to play, and where my neighbours shall be decent and tidy, and the ears of my family shall not be shocked by oaths and impure words, and their eyes not become familiar with the doings of the vicious. But another man will say—My motto is, "Let us eat and drink, for to-morrow we die"; it matters not where I live, provided I dress well and fare well. I must have my pipe, I must have my glass, and I must be reckoned a jolly fellow by my friends; I must frequent the theatre and public entertainments, and endeavour to make this at best dull life pass merrily. Then, when the income of such a man falls short of his expenditure in carrying out a programme such as this, he says—Really, house rents are so high, we must keep lodgers, or be satisfied with a smaller house, or remove to a cheaper locality. We cannot afford to be nice.

---

[1] Glasgow Health Lecture, No. iii. (1881).

Or he persuades his wife that she must leave the care of her family and seek work, or take in work of some kind, or take a room with a shop at the back, and involve his household in a muddle with the cares and distractions of business, ending in general discomfort and dissatisfaction, which confirm him in seeking pleasure anywhere but at home, and leave their mark in the health and morals of his children. It is sixteen years since Dr. Hunter, in a Report to the Privy Council on the "Housing of the Poor in Towns," wrote—"From one point of view, crowding in Glasgow means the diversion of income from rent to supply whisky." I fear that to this day these words are true of a great many of our townsmen: but without for a moment seeking to apply them as a sweeping condemnation, I must confess that this is the most reprehensible manifestation, found among the most worthless, of what pervades a large class of the community—a tendency to depreciate the importance of house accommodation in apportioning the outlay of their income between house, food, and dress.

Glasgow is pre-eminently a city of small houses. There are, in round numbers, 107,000 occupied houses within the municipality. Of these, 30 per cent. consist of but 1 apartment. 44 per cent. of 2 apartments, 15 per cent. of 3 apartments. 6 per cent. of 4 apartments, and the remainder, or only 5 per cent., consist of 5 apartments and upwards. The average number of rooms in each house is 2⅓ (2.34), and of persons inhabiting each house nearly 4¾ (4.738); so that, including every house in Glasgow, from the humblest to the most luxurious and capacious, there are rather more than 2 persons (2.054) to each apartment; and the average rent of each house is £11 6s. 9d. These figures represent the average judgment of the householders of Glasgow on the question presented to each individually, and decided by each independently, and according to the best of his intelligence—What accommodation do I require, and how much ought I to set aside out of my income to pay for it?

It is the occupants of small houses whose ear I wish to gain.

There are certain common broad conditions of health for the provision and maintenance of which the authorities are responsible. These are—clean soil upon which to stand; pure water and pure air, with all the subsidiary arrangements for drainage, cleansing, and scavenging. It is especially necessary in the interest of the small householder that the local authorities should do their duty in these regards. Even he, however, is a ratepayer, and can make his voice heard through his representatives, and give them moral support and stimulation in their contests, on his behalf, against the vested interests of property. Glasgow is well off in regard to all these general conditions of health except one—the quality of the air. Our water is the purest, our air the most impure in the three kingdoms. This is distinctly remediable, by improvement in the general arrangement of streets and buildings, and by the enforcement of the Smoke Act, and the more rational use of coal. As things are, the greatest obstacle to domestic ventilation is the offensive quality of the outer air. Our housewives find that the best thing they can do is to shut it out with all its smuts and smells. This is a matter worth the attention of Ward Committees and other associations of ratepayers.

In the choice of a house, every householder may assist in a general reform and improvement of the character of the city. The buyer makes the market. So long as there are tenants for unhealthy houses, there will be unhealthy houses to be had. But you may justly say: when we go into the market to buy our food we are protected by the laws of the country from the risk of buying adulterated or injurious articles; why should we not also be protected from the more serious risk of having a house which is not "of the nature or quality demanded?" I can only reply that you ought to be so protected, and that you have only to say it must be, and it shall be. Every house ought to be inspected, and tested, and certified to be in its general structure and arrangements habitable before it can be offered for habitation. As things are the introduction of inhabitants is the test applied. Moreover, just as ships are re-surveyed and re-classed at Lloyd's, houses should from time to time be tested. Until this is done, you may with advantage consult the record of a "Pathological Register," kept at the Sanitary Office, in which all deaths from infectious diseases are entered opposite the streets, and the numbers of the streets in which they occurred.

Let me now suppose that you are in search of a house, and let me be your adviser for the occasion. What I wish to do is chiefly to get you to think; not that "house-hunting" can ever be engaged in without thought of some kind, for every honest man is forced by the resources of his purse to think in a fashion; and even as to health and air space, "the practical limit of purity will depend on the rent which men are willing to pay for it." But, as I said at the outset, there are two ways of thinking upon house-room, even in an economical aspect. Before you go house-hunting, ask yourself first—What are the general requirements of my family in respect of space?" The question has to be brought both to a physical and a moral standard. Overcrowding leads as certainly to moral as to physical deterioration.

Just consider for a moment what the small Glasgow house means when viewed from these standpoints. Those who live in large houses, in the customary enjoyment of all their privacies, ought to make an effort to think out in detail how they would feel if their whole life, personal and family, were suddenly to shrink within the limits of one or two apartments; if their refined ideas of delicacy, their virtues of modesty and propriety, their opportunities of private ablutions, their retirement in times of sickness, in the events of birth and of death—were suddenly deprived of the conditions of space, which they have come to regard as essential. It is almost too horrible to express in naked, uncompromising language the jostling of birth and death, and the functions of life which must be the daily experience of those small houses. If grapes grew and ripened in the slums of Glasgow, or the orange and myrtle were as luxurious and plentiful as daisies or thistles in the fields, people would say, It is a miracle; and yet we go confidently in search of delicacy and refinement and high-toned morality, amid physical circumstances which are equally inimical to those finer growths and efflorescences of the moral nature of man. Virtue in the individual is to be prized in proportion to the adversity of the conditions under which it has blossomed into life; and therefore I say to those who are virtuous under circumstances which make the task easy, consider the hourly struggle of your less fortunate brethren, and when they have agonised so as to maintain and even bring to perfection "the white flower of a blameless life," honour and respect them for it; but above all things do not toss the head of pharisaical disdain at their faults and imperfections.

That is all I shall say on the moral aspects of sufficient house-room. It is with the physical I am at present most concerned, and, happily, whether we look at the matter from the one standpoint or the other, we reach the same conclusion. The best physical are the best moral circumstances. On the average, if we have sufficient space for the moral life, we have sufficient for the physical, and *vice versa*. The physical motive of a house is to provide for ourselves a special climate, excluding the changeful elements, shutting off a space around our bodies, into which wind and rain shall not penetrate, which shall be warmer in winter and cooler in summer than the main body of the outer space, and at the same time approach the standard of purity of that outer space as nearly as possible. If you build up a man in a hermetically closed space, the heat evolved from his vital processes will raise the temperature; and the products, gaseous and solid, of these processes, will impregnate the enclosed air. He will be his own fire, and the fire will gradually extract the ingredients in the air which are necessary for its maintenance, and replace them with ingredients which tend to extinguish it. Life is therefore attacked in two directions, and is ultimately destroyed—how soon depends upon the size of the hermetically closed space. As our object is to determine not how long a man will cease to live, but at what point he will cease to be in health, or in circumstances conducive to health, we shall take for our standard that condition of the enclosed air where it has acquired a proportion of the vital effluvia which is so much above that of pure outer air as to be injurious. As a rule, house air must be less pure or more impure than the immediately outside air; but a certain point of excess must be reached before it becomes practically unhealthy. Carbonic acid is regarded as the element in air which affords the best general indication of its degree of purity. There are other even more noxious impurities; but in so far as the whole mass of the contamination of the air rising from animal life is concerned, these bear such a general fixed proportion to the carbonic acid that, having ascertained the one, we may infer the proportional presence of the other. There is, then, a general agreement that air which contains in every 10,000 cubic feet 4 of carbonic acid gas is pure, and that when there is 2 cubic feet of added carbonic acid, it has reached the limit beyond which the air is sufficiently impure to be injurious; so that if you begin with four volumes of carbonic acid in an enclosed space, which is the proportion in normal outer air, as soon as you pass six volumes, the enclosed space becomes unhealthy.

We have started with the supposition that the space is hermetically closed. Obviously in such a case, the time which will elapse before the conditions become unhealthy will depend upon the size of the space. If the space is only 50 cubic feet, then in one minute the limit of health will be passed; if 500, in ten minutes; if 5000, in one hour and forty minutes. We are thus brought to the conclusion that it is upon the renewal of the air within the space rather than its size that unhealthy life depends. No matter how large the initial space, it is only at the most a question of hours how long it will continue to be healthy. Further, we may easily satisfy ourselves that air may be only partially enclosed; and yet, owing to certain physical laws, we shall gain little in the way of renewal, and scarcely at all extend the limit of health. Take the top off our hermetically closed box, and raise its sides perpendicularly, and although the whole expanse of heaven rises above it, a man will soon perish at the bottom.

As has been said—" A man may be suffocated in a well, or even in a crowd in the open air, where the space in each case perpendicularly is unlimited." We therefore conclude that the cubic space in which a man lives must not only be of a certain amount, but it must be distributed in a certain proportion. it must be of a certain superficial area in relation to the vertical height; *i.e.*, in the nomenclature of the house, the floor space and the height of the ceiling must be duly proportioned. Still, adopt whatever initial cubic space we please, and distribute it in width, breadth, and height as we may, we come back to the axiom that it is upon the renewal of the air within the space, rather than its dimensions, that healthy life depends.

This, at first sight, seems not to bring us much nearer to an answer to the question—What are the requirements of my family as to space? Space implies dimensions, and we have arrived at the conclusion that it is upon the renewal of the air within the space, rather than upon its dimensions that health depends. In reality, however, we have come to the threshold of the answer to our question, we are within sight of the principle upon which the question must be answered. Let us throw aside the idea of a hermetically enclosed space and consider the circumstances of an adult man in a space for which means of ventilation are provided—the expulsion and displacement of foul air by fresh. In order to maintain the enclosed air around an adult man at a standard of purity, within 6 cubic feet of carbonic acid per 10,000, it is necessary that he should be supplied with 3000 cubic feet of fresh air per hour, and that whatever the initial size of the apartment may be, because, as we have seen, the benefit of additional space amounts only to a matter of hours at the most added to the time when the limits within which health subsists shall be overpassed. But renewal of air means the movement of air, and movement of air means draughts, and draughts mean disturbance of bodily temperature, and disturbance of bodily temperature means discomfort or even injury to health. Therefore, efficient ventilation implies essentially the supply of fresh air in quantity sufficient to maintain the standard of purity and yet not derange the temperature and produce draughts. The basement condition of efficient ventilation thus manifestly is the determination of the minimum space through which sufficient air can be made to pass without draughts, or with the least risk of draughts. If you set out with 100 cubic feet of house-room, you must, to obtain the necessary 3000 cubic feet of fresh air per hour, change this 100 cubic feet no less than 30 times every hour, whereas, if you set out with 1000 feet of air, you need only change it three times every hour. In the former case you will have draughts, in the latter none.

I have thus given you the problem of ventilation in the simplest form; but amid all complications, the underlying principle is the same. Healthy people are more independent of draughts than delicate or sick people; but sick people require more frequent renewal of air than healthy people, so that for them ventilation without draughts is more difficult. But the element of temperature is the most disturbing and disconcerting of all; and in this latitude, therefore, warmth and ventilation must go hand in hand, they must be reconciled. This is the great problem in the small houses of the poor. Heat they must have. Their underfed and insufficiently clad bodies demand it, and they too often obtain it by being their own fires, by huddling together so as to utilize the vital heat of their bodies, and closing up every aperture by which that temperature escapes, which means also every aperture by which fresh air may obtain admittance. Our sense of draught depends upon the temperature of the moving air; so that in this climate we require a greater cubic space to secure sufficiently frequent renewal of air; and in cold weather we must either warm the fresh air or submit to diminished ventilation for the sake of heat, and this latter is practically the alternative which is accepted by the majority. Such considerations as these underlie various minimum standards of cubic space which have been adopted where regulations or specific legislative enactments have been found necessary to secure average conditions of health for people in special circumstances, such as soldiers in barracks, the sick in hospitals, paupers in workhouses, prisoners in jails, lodgers in common lodging-houses, and the inhabitants of small houses generally. In barracks there must be 600 cubic feet of room-space per man. In Glasgow, our

Police Act fixes the minimum in small houses at 300 cubic feet per adult, and 150 for each child under eight.[1] Such houses may be measured and "ticketed," that is to say a ticket affixed on the door, so that those who wish to rent them may know what is the maximum number of persons who may legally inhabit them. I was on the point of saying "may safely inhabit them"; but, although the Police Act permits occupants in the proportion of one adult or two children to every 300 cubic feet, you must not run away with the idea that you may take that for your standard. This is one of the risks of legislative standards of any kind. They may be perverted by ignorant or dishonest people. The Vaccination Act says that that simple and beneficent operation must be performed before the child is six months old, and many mothers think it dangerous until that time has expired. A certain proportion of water to solids is selected as a standard of purity for milk, and some milk dealers are scrupulously careful to give you milk which shall approach that standard as closely as possible. In like manner I have heard the 300 cubic feet of the Police Act held up as the golden rule of house room, even for the sick inmates of a poorhouse. So far is this from being the case that the Local Authority of Glasgow are convinced that this space is too little for health; and it can be proved to be so. Knowing this, it was recently proposed to raise the standard for small houses in Glasgow to 400 cubic feet, but the proposal was opposed by the landlords and the house factors, as confiscation of house property, as ruinous for the working classes, and likely, in fact, to result in derangement of the whole fabric of Glasgow society. In truth, to change the air in a space of 400 cubic feet six times an hour in this climate, by the ordinary methods of natural ventilation, would be intolerable, even if practicable. Scarcely half that rate could be accomplished without injurious draughts. When you find that 600 cubic feet is the standard adopted for barracks as necessary for the health of men whose health means available service for the nation, and their sickness not only loss of service but added expenditure, you may conclude that this space is a very fair compromise between the economy of barrack accommodation and the most exacting conditions of health. I shall leave all these important details to your sober and intelligent judgment, as aids to reflection in the choice of a house of size proportioned to your requirements, with this wise saying of Dr. Parkes: "After all, the question is, not what is likely to be done, but what ought to be done; and it is an encouraging fact that, in most things in this world when a right course is recognized, it is somehow or other eventually carried out."

---

[1] By the Police (Amendment) Act of 1890 this was subsequently extended to 400 cubic feet per adult, and 200 feet for children under 10. The provision for ticketing now extends to all houses not exceeding 2600 feet. [(Police) Order Confirmation Act, 1904, Sec. 10.]

The next question is whereabouts shall I look for a house, first, in what district of the city? I do not wish in regard to this or any other matter to preach impossibilities. The elements to be taken into consideration are chiefly two—the health of yourself, and especially of your children. Unfortunately these are often somewhat divergent claims. Undoubtedly your own convenience, and in some degree your personal comfort whisper—live near your place of employment; while, as undoubtedly, the health and general welfare of young children say—live as far as you can from the populous centre, whether that be near the workshop or the warehouse or no. I leave this also to your intelligent and deliberate judgment to decide, and in your decision to reconcile as best you can, interests which may happen to be opposed. I only beseech you, in the children's name, sacrifice your own convenience wholly, and your comfort, as much as you conscientiously can, for the sake of giving them room, not merely to exist, but ample enough for health, and with convenient space in the form of a well-lighted court, or a bit of grass, or public garden ground, or square, or in the near neighbourhood of the fields, in which they may play and be happy, out of the hurly-burly of the crowded streets, which are not more dangerous to life and limb than to morals. You have the ready and cheap tram-car to convey you; and even if you should have an early tramp in a dark morning, and a not over-comfortable meal by the roadside, or in your workshop, remember that the life of the parent must, from first to last, be one of self-sacrifice, and that the best legacy you can leave your children is a healthy body, and a mind stored with the pure and cheerful associations of a happy childhood. In whatever direction therefore you may be forced to stint or economise your purse or your personal exertions, don't begin with your house, either in rent or situation. That, believe me, is, in its ultimate issues, the most profitless of all economies.

In giving you a standard of purity for the enclosed air of your house, you would observe that it was measured as a certain inavoidable excess of impurity over the free outer air. Obviously, then, the condition of the air outside your house will determine the range within which you may have added impurity inside without transgressing the margin of healthfulness. Without going into details, it may be said that the nearer you live to the outskirts of the town, you secure a better air from which to draw your supply for ventilation, and consequently your houses will not so soon become close and stuffy, and unhealthy. In the central streets of Glasgow, even what we call the open air is impregnated in general with more carbonic acid than is found in air of the normal standard. But there are confined spaces, such as back courts, sunk areas, and lobbies, which are the main resources for the ventilation of houses, and which all approach dangerously near the utmost limit of added impurity, and in many cases surpass it; so that these houses never can, in the nature of things, be properly ventilated. For this, and various other reasons to be specified. I can at least warn you not on any account to select a house in certain easily recognized positions and circumstances. Don't live in a back tenement, inside a hollow square. You might as well live inside a Chinese puzzle. Don't live in places bearing the ominous designation of "Muse Lane," or in any other narrow and sunless lane, even if it should be dignified with the name of "street." Don't live in a sunk flat, if you wish to have a chance of escaping rheumatism, consumption, and diseases of the lungs generally. Cellar dwellings have been to a certain extent proscribed by law, their unhealthiness is so notorious; but in the necessary legal definition of such dwellings many escape the verbal meshes of the definition, which are quite as unhealthy as those which are illegal. Here we have another illustration of the perversion of a minimum legal standard; because, if your ordinary landlord can trim the requirements of his houses to meet the bare necessities of the law he is satisfied. It is for you to have regard to the spirit, not the mere letter of the law. The spirit of the law is this—that every house against the walls, or any part of the walls, of which the soil rests above the level of the soil beneath the joists of the floor of the ground flat, is unhealthy. The air only should rest upon the walls, otherwise they will be damp, and the space beneath the floor cannot be ventilated; therefore, avoid such houses, and, in general, never live below the level of the earth's surface, whether there be sunk areas or not. I would also advise you to avoid altogether even a tenement which is otherwise unobjectionable, if it has cellar dwellings at its basement. The inhabitants of such places are rarely good neighbours in a moral sense, and they cultivate infectious diseases, whose germs are apt to pervade the upper flats, and attack yourselves and your children. Further, don't take what is technically called a "back-to-back" house; they resemble caves, or the rock dwellings of eastern lands. There can be no through-and-through ventilation, which is the only thorough mode of renewing the air of enclosed spaces. This is most apt to be wanting in single apartments, the best of which are those opposite the stair landing, in which case, the lateral houses, generally of two apartments—one to the back, the other to the front—are also provided with this condition of health. Finally, avoid what are called "made-down houses," *i.e.*, houses originally of several apartments which have been sub-divided among several tenants. A house is, or ought to be, an idea expressed in stone or brick—a structure designed for a certain mode of occupancy; and if the mode of occupancy is changed, without a corresponding change of structure, it cannot be healthy. These made-down houses are easily recognised if you are observant. Long dark lobbies are a safe ground for suspicion; and if you discover such things as presses, or sinks, or W.C.'s in the lobbies, or traces of hat pegs or gas pendants, or kitchen mantelpieces in one house, and ordinary room mantelpieces in another, your suspicion may be held to be confirmed. These little characteristics explain the cause of the dark lobbies; but the dark lobbies should be enough to frighten you away, whatever its cause.

Having asked you to set aside houses of a certain kind as essentially and irredeemably unhealthy, there are a few questions applicable to all houses which you ought to ask, and a few points to observe which I shall shortly mention. Is this house dry? If you avoid sunk houses, the general cause of dangerous dampness is the premature occupation of newly-built tenements. All building materials are more or less porous. Even a good brick can absorb into its pores from 10 to 20 per cent. of its weight of water, and the best Craigleith sandstone 8 per cent. The mortar and plaster contain still more water. A new tenement, therefore, is saturated with thousands of gallons of water, which must be got rid of and replaced by air. The presence of water is injurious to health in two ways. It stops the natural functions of the walls of the house, which promote ventilation by the passage of air into the interior. This is a little thought of but important element in ventilation—a path for the entrance of filtered air which cannot be altogether stopped up, and does not attract attention by creating draughts. Yet it is possible to blow out a candle through a cylinder of dry mortar coated with wax, and five inches long, and even through a brick similarly prepared; but if the mortar or the brick be saturated with water, they become quite impervious to air. So that the pressure of the wind upon the outer walls of our houses, or the in-draught in cold weather from the outer cold to the inner hot and rarified air are made entirely useless for ventilation by dampness. In another way, also, damp is injurious. A damp house is a cold house. It causes a great loss of heat by evaporation from its surfaces. If you sit next a damp wall, still worse if you sleep next one, the side nearest the wall becomes chilled, rheumatism attacks the joints, the lungs may become inflamed, and other diseases, arising from unequal cooling of the body are apt to be engendered. Only a large expenditure for fuel will dry a house at your cost, which ought to have been dried gradually by free admission of air, before your landlord put it in the market; and after all, your health cannot but be impaired.

Another question which you should put to yourself when looking at a house is this—Is it airy? Can the winds blow about and against its walls? Are its approaches—the close, the common stair, the lobby, freely ventilated? If you avoid the houses against which I have warned you, you will shun those which are most seriously defective in this respect, but there is still room for care in your final choice. A common stair is simply a lane leading upwards, for public use, and should not have any characteristic smell, or give an impression to the senses different from the open air. There ought to be large ventilating apertures at the top, and windows on every flat. Some stairs are buried in the centre of the tenement, touch the outer walls nowhere, and are simply dark tunnels set on end. Avoid such stairs and prefer those which end in a cupola, with a ventilating space round its entire circumference. Stair windows are almost invariably exactly the same as ordinary house windows; and when one tenant opens another is sure to shut them. A portion ought to admit air independent of any interference, and in crowded staircases in the older parts of the town, a light open grating would be much better than glazed sashes. As it is, and fortunately so, the panes of glass are usually broken in such situations; but while good for ventilation this is an unsightly state of matters, and suggestive of anything but respect for property. It is even more necessary that common lobbies should be full of pure air, and not channels by which the effete air from one house may pass into another. It is as much the duty of your landlord to lead the fresh air up to your very door as it is for him to lead pure water to your kitchen tap.

Both are necessities of life, and you ought to look as particularly into the one arrangement as the other. Light is as necessary as air, and in general they cannot be separated. A staircase, or a lobby, or a house, which are dark, are certain also to be close and ill-flavoured. I would advise you, then, to give the preference to tenements situated in streets which run north and south and are as wide as the height of the tenement, and not to select a house from which you cannot see the sky when you stand at the windows. The best lighted room is one from which you can see the largest area of sky at the farthest distance from the window.

Here I wish to say a few words as to the extreme importance for health of direct sunlight. An Italian proverb says—

"Where the sun cannot enter, the doctor does." There is an immense body of observed and recorded facts in proof of the life-giving, health-sustaining influence of light; but really I have not time to-night, nor, in fact, am I much in favour of condescending, to lead proof that "the light is sweet, and a pleasant thing it is for the eyes to behold the sun." Take your Bible, and from its first page, which records that God's first gift was light, to the last, where we are told that the chief physical feature of heaven is that "there shall be no night there," because the Maker of the sun has dismissed His faithful servant, and "covered *Himself* with light as with a garment,"—from first to last of the Holy Book, light is associated with physical and moral good, and darkness with physical and moral evil. This association still subsists. I wish, however, to make reference to one recent observation as to the influence of light upon health. You have heard from Dr. Gairdner of that large family of minute living organisms whose representatives are everywhere to be found, and among whom are the greatest enemies of health and life—those germs or bacteria which Pasteur has made his peculiar study. It has been proved by experiement that bacteria may be absolutely killed by sunlight, that sunlight is a universal disinfectant; that this disinfecting influence is exactly proportioned to the duration and intensity of sunlight, most powerful in direct, but still distinct in diffused or indirect sunlight. Therefore, I say to you, avoid houses whose precincts are dark or badly lighted, and have no dark places inside your houses, which may be haunted not by imaginary ghosts, but by these microscopic impurities. Darkness and dirt, generally of the rudest visible sort, always at least of this invisible sort, go together. Admit sunlight freely whenever you can. Keep up the window blinds.

Before finally deciding to take your house, there are one or two matters concerning its internal arrangements about which you ought to satisfy yourself. The best distribution of your apartments is that which gives you access both to the front and back of the tenement, and therefore secures to you through and through ventilation. Two apartments, of which one is at the front, the other at the back, are much better than two at the front or two at the back. In tenements of small houses the water closet should be on the stair. It is a most dangerous "convenience" to have in a house of less than four apartments. Wherever a water closet is, it ought always to be against an outer wall. You will sometimes meet with them on the landing, sandwiched between two houses, and the space on either side used as a cupboard, or even as bed places. Box beds, or built up bed places, are always unhealthy; but when at one end they are separated only by a thin partition from a water-closet, they become doubly dangerous. There is no sleeping accommodation so healthy as a plain iron bedstead. Look also to your water supply. When, as a community, we have spent two millions of money to fetch pure water from Loch Katrine, it is surely madness to allow a landlord to put it through a cistern over a water closet before you drink it. See that your water tap supplies you direct from the main. The windows ought all to be sashed, and their cords good, so that you can open them at will. All these, and many other minor matters affecting the salubrity of a house, should be seen to before concluding your bargain. In my experience, the tenants of small houses often go about the taking of their houses in a very foolish and unbusiness-like way. They do not look before they leap, and are no sooner into their new building than they discover defects which ought to be perfectly obvious to any person of ordinary powers of intelligent observation, before becoming tenants.

I must now draw these remarks to a close with some advice as to the proper use of your house; for while there are houses which no care or pains on the part of the tenant will make healthy, there are also tenants, who, by mismanagement and carelessness, will make the most healthy house for them unhealthy. I have already told you that a city of small houses, such as Glasgow essentially is, demands much more strict supervision in its general construction, and more ample provision of the common external conditions of health, than one of large houses. I now add that small houses require much more careful and intelligent management, so as to keep within the narrow limits of the internal conditions of health, than large houses. You are working with the smallest possible margin of space between you and disease, or the conditions which produce disease. An asthmatic man is made short of breath by the slightest cold, or the least deficiency in his supply of pure air—and Why? Because he works upon a small margin of health. He is always bordering upon breathlessness, and a change, which makes no difference to a robust man with sound lungs, at once lands him in difficulties.

To maintain the purity of the air contained within the walls of your house must be the prime object of your management. The condition of the air proclaims, with the most sensitive exactness, the condition of all surfaces on which it rests and over which it moves. I, of course, presume that overcrowding does not exist. If it does, then you may be as cleanly as you please, your incessant, necessary vital functions will contaminate the air, and you can only moderate, not prevent the contamination. But always, and in all circumstances, a small house demands scrupulous care and cleanliness on the part of its inmates. Let us run over shortly, in detail, the chief items of cleanliness which are summed up in the crucial test of a well-arranged house—pure air. There are the containing surfaces, the floor, the walls, the roof. The debris of your bodies, solid and gaseous, settles upon, and adheres to, or is absorbed by those surfaces. The dust of the city, and those minute and injurious organisms of the common air, subside in the quiet house space like the sand in the slow-moving eddies of a river. Therefore, the housewife must be constantly busy dusting and refreshing the surfaces of her house. This labour will be lessened by the nature of those surfaces. The plaster should be smooth and well-finished; the floors carefully laid with well-seasoned wood, so that chinks may be as few and small as possible. Whatever may be the nature of the covering upon the plaster of the walls and roof, it must be kept clean. If it is size colouring, white wash, or lime wash, renew it at least once a year. If it is paint, dust it down frequently and wash it occasionally. If it is paper, select a paper of good quality, with a smooth surface, dust it down also, and always have the dirty old paper carefully scraped off before you put on a new one.

The furniture of a small house ought to be limited to the absolutely necessary, and not bulky. Every cubic foot of furniture introduced deducts a cubic foot from the air space. Let its surfaces be hard and impervious. Avoid haircloth in chairs and sofas. Cushions covered with cloth will afford the requisite comfort, and are easily dusted and cleaned. Carpets, for the same reason, entail much labour, if they are to be prevented from becoming stores of dust. They ought to be kept clear of chests of drawers and other heavy pieces of furniture, so that there may be no excuse for not lifting them frequently. Dust and rub carefully all your furniture. Here science steps in with an interesting and curious contribution of facts in support of the seemingly exacting demands of practical sanitarians. Dr. Angus Smith, who knows more about air and the conditions affecting its purity than any other living man, tells us—"If you wash a chair, or a table, or anything in a room, you will find ammonia in the washing; and if you wash your hands you will find the same; and your paper, your pen, your table-cloth, and clothes, all show ammonia; and even the glass cover to an ornament has retained some on its surface. . . . This ammonia on the surface is partly the result of the decomposition continually taking place, of organic matter adhering to everything in dwellings." This doctrine is of most importance to the women of our households; and don't let them dismiss it with an incredulous smile, because it speaks of that which is only perceptible to the vivid eye of the philosophic chemist. The greatest triumph of modern surgery, what is called antiseptic surgery, the product of Lister's genius, consists wholly and absolutely of a conflict with that which is imperceptible to the unaided senses—those princes of the powers of the air of which I have spoken, and yet it saves hundreds of lives every year. Let Dr. Smith's curious observation, therefore, give vigour and pith to your arms in your domestic labours. This observation also leads us directly to observe the important relation of the cleanliness of the persons, clothing, and bedding of the inmates of small houses to the condition of the air in which they live. It is possible to be so dirty in all these respects, that although all new vital functions were to cease and determine, the accumulated products of past vitality would contaminate the atmosphere of the house. Be thorough: don't fancy that a clean outer garment, or a clean coverlet are enough. They may save your credit by keeping up appearances, but nothing more. Pursue cleanliness therefore of person and clothing as eagerly and unceasingly as the alchemists did the *elixir vitae*. The quest is more hopeful, because you will certainly find the true secret of a long and healthy life.

There are certain adventitious and temporary causes of air-deterioration which demand a passing word. Remove all refuse, whether of your own bodies, or of your domestic hearths, and cookery immediately. If there is any unusual smell perceived don't rest until you discover its cause. Never neglect a smell. Keep the surface of your W.C.'s scrupulously clean. Take your turn regularly with your neighbours in sweeping and washing the stairs and landings. Put all the dust of your house into the fire. It is volatile. It contains those microscopic powers of darkness among its grosser constituents. You have got them within your power. Reduce them to their primary harmless chemical components by combustion, and you have made an end of their career.

But I am not yet done. All these efforts after cleanliness only put off the evil hour if you do not ventilate your house-room. Minimize as we may the progressive contamination of an enclosed inhabited space, the contamination is still progressive, and without renewal of the air, in a few hours you will reach the boundary beyond which lies impaired health. Open your windows, pull up your window blinds, turn up your mattresses and bed-clothes, and every morning let the products of the night be swept out by the incoming current of fresh air. Then, all through the day, remember to have a small chink open at the top of your windows; or, better still, raise the lower sash, close the opening beneath with a piece of wood fitting closely, and so the air will enter at the junction of the sashes and pass upwards without draught. The secret of ventilation without draughts is a little and constantly. Once permit the air to become close and stuffy, and the moment you endeavour to remedy this result of carelessness a cold draught will rush in, and the fear of injury will prompt you to stop it. The mere fact of living in a close atmosphere begets a shivery, susceptible condition of body which is intolerant of the slightest sensation of chill. If you accustom yourself and your children to fresh air you become robust; your lungs play freely, the vital heat is sustained and even a draught becomes exhilarating. The sensitiveness of your lungs to irritation and the consequent liability to catch colds arise chiefly from the chronic effects of foul air. The air does not contain oxygen sufficient to aerate and purify your blood. You inhale a proportion of carbonic acid above the standard of pure air, and the blood of your arteries, which ought to be clarified and reddened by every act of inspiration and expiration, approaches more and more the colour of the impure blue blood of your veins. Your bodily temperature falls—in popular phrase, you "look blue," and you feel cold. Your lungs are always congested and loaded with impurities, and you suffer from the prevalent disease of Glasgow—chronic bronchitis. Finally, let me anticipate a criticism upon all this talk about standards of pure air, about cubic feet of space, about constant renewal, so as to maintain the standard below six volumes of carbonic acid per ten thousand volumes or cubic feet of air. You may say, what do we poor folk know about standards and volumes of carbonic acid? We are not men of science. We cannot analyse air. We must live by rule of thumb; and it seems to us, if all this science is necessary to enable common folks to be healthy, we must also die by rule of thumb. Not so fast, however. The standard of carbonic acid was certainly determined first by rigid scientific experiment, under rigid scientific conditions, with all the resources of the chemist; but it occurred to the experimenters that they had noses, that all people, even the commonest, have noses; and that there were certain popular standards founded upon the judgments of those noses, and expressed in such familiar adjectives as "fresh," "close," "stuffy," and so on. The happy thought occurred to them, to endeavour to ascertain how those judgments of the nose would compare with the determinations of the chemist. They first carried their noses from the pure outer air into the confined space of an occupied room, under gradually varied conditions of ventilation. They carefully noted the judgments of their noses in those familiar terms on each occasion. They then, after each judgment, brought their chemical apparatus into the room, and recorded with equal care the precise proportion of carbonic acid present in the air. They entered the figures of their analyses in columns corresponding to the judgments of their noses; and what was the result? There was perfect agreement. Opposite "fresh" there was 5.8 cubic feet of carbonic acid per 10,000 cubic feet of air; opposite "a little smell" there were 7.8 cubic feet per 10,000 of air; opposite "close and disagreeable," 10.3 cubic feet; opposite "close and extremely stuffy," 12.4 cubic feet. So you see every man, woman, and child of you carries about an instrument as delicate as the chemist's balance, viz., a nose.

Only, just as the chemist must keep his balance from rust and dust, otherwise its delicate adjustment will become deranged; so you must keep your noses educated by familiarity with fresh air, otherwise they will cease to be trustworthy. The power of appreciating fresh air is a matter of education and usage. It may be cultivated until the desire for fresh air becomes habitual and irrepressible. It may be neglected and debased until the fresh air is obnoxious, or, at least, foul air ceases to be recognised. My last words to you are, therefore, cultivate in yourselves and your children this wholesome appetite; educate your noses into the recognition of fresh air and they will cease to tolerate foul.

THE HOUSE IN RELATION TO PUBLIC HEALTH.[1]

It may be said of space, in a literal sense—In it "we live and move and have our being." In terms of space we may express the main physical conditions of existence in the proportion in which they are shared by men under the varied circumstances in which they live. Our bodies fill a certain cubical space. The basis of this cubical space is the two dimensions of a certain area of the superficies of the earth. On this surface rests the air we breathe; on it falls the regenerating sunlight, and the rain which is the ultimate source of the water we drink; on it we build our houses and conduct the business of our lives. The proportion of the numbers in which we live upon it determines the proportion in which we share the prime physical conditions of health—air, sunlight, earth-space sufficient to give free play to those operations of nature which will keep our environment healthy if they are not overtaxed by the aggregation of men.

These relations of human life to space were recognised by Dr. Farr as soon as the vital statistics of England furnished him with the necessary data. Working upon the mass of facts presented by each successive census, as to the distribution of the population on the soil, considered in relation to the local incidence of mortality in the intervening decennia, he gradually constructed a physical basis for vital statistics and erected them into a science. He proved that the apparently confused local phenomena of mortality were subject to certain laws capable of exact numerical expression, and of reduction to mathematical formulæ. It became possible even to work out from the results of life under physical conditions thus exactly expressed for one local area the results of life under other physical conditions expressed in the same terms for other local areas. The reflex effect upon sanitation was immediate and obvious. A theoretical standard of health was established, toward which the practice of sanitary science could work on precise lines. The results of this work could be measured and formulated at each census. The evils of aggregation had been measured. The object of sanitation was twofold, to minimize aggregation as an evil in itself, and to discover how to minimize the evils of aggregation in so far as and inasmuch as it is a necessary condition of civilized life.

---

[1] Read before the Insurance and Actuarial Society of Glasgow, 26th January, 1887, and published in their *Transactions*, Second Series, No. 5.

Dr. Farr had to create a terminology for his new science. *Density* is the number of persons per unit of area on which they live. The unit may be square yards, or square miles, or square metres. Divide the population by the area, however expressed, and you have the number of persons per unit—the density. The *Areality* is the unit of area per person living on that area. The areality is therefore the reciprocal of the density. *Proximity* is a function of the areality. It varies in the ratio of the square root of the areality. Density, areality, and proximity are all founded upon the hypothesis that the population is equally distributed over the surface of the area on which they live. Each individual is supposed to be placed in the centre of a hexagonal plot of ground, and the area of this hexagon being known, the proximity or mean distance between each person can be calculated. The yard or the metre is the most convenient unit in which to express proximity. You will find the mathematical demonstration of these laws, with their formulæ, in the Report of the Registrar-General of England for 1877, p. 231, by Dr. Farr, and by a different method in the Scotch Registrar-General's Report for 1875, by Professor Tait of Edinburgh.

Such were the precise methods of measuring and expressing the different physical circumstances of masses of people in relation to their comparative mortality and the incidence of disease introduced by Dr. Farr. The importance of this new method of dealing with vital statistics cannot be better shown than by contrasting the generalizations derived from a survey of the local incidence of mortality in England before and after Dr. Farr's investigations. In 1775 Dr. Price expressed his deductions from a review of the imperfect statistics of his day, thus :—" It may be stated in general that whereas in great towns the proportion of inhabitants dying annually is from 1 in 19 to 1 in 22 or 23, and in moderate towns from 1 in 24 to 1 in 28 ; in country parishes and villages, on the contrary, this proportion seldom exceeds 1 in 40 to 50." Expressing these data in the way more familiar to us, as death-rates per 1000 living, we shall better recognise how unhealthy the nation then was. They range from 53 per 1000 in " great towns," and 42 in " moderate towns," to 20 in " country parishes and villages." But such statements give us no idea of the physical circumstances associated with these death-rates any more than the terms " high fever," " moderate fever," or " feverishness " would enable us to estimate and compare the gravity of three cases of febrile disease. The physician now-a-days would say that the temperatures of the cases ranged from 106 deg. F. to 103 deg. F. and 101 deg. F., his datum point being normal temperature, of 98 deg. F. to 99 deg. F. Contrast Dr. Price's deductions with those of Dr. Farr when in 1871 he surveyed the retrospect of the local mortality of England in the ten years 1861-70. He says :—" Now, excluding the London districts, about which there is some difficulty, we have seven groups of districts where the mortality ranges thus—17, 19, 22, 25, 28, 32, and 39. In the same districts the numbers of persons to a square mile are—166, 186, 379, 1718, 4499, 12,357, and 65,823. Thus in Liverpool, the densest and unhealthiest district in England, there were 65,823 persons to a square mile, of whom 39 per 1000 died annually. This series of facts may be put in a different way : the nearer people live to each other the shorter their lives are. Thus, the proximity of people in 53 districts is 147 yards, the mean duration of life is 51 years ; in 345 districts the proximity is 139 yards, and the mean duration of life is 45 years ; in 137 districts the proximity is 97 yards, and the mean duration of life is 40 years ; in 47 districts the proximity is 46 yards, and the mean duration of life is 35 years ; in 9 districts the proximity is 28 yards, and the mean duration of life is 32 years ; in Manchester district the proximity is 17 yards, and the mean duration of life is 29 years ; in Liverpool district the proximity is 7 yards, and the mean duration of life is 26 years. This is a determined law ; and the duration of life being given in one set of conditions, the duration of life in another set of conditions is determined from the proximities."

" The nearer people live to each other the shorter their lives are." Such is Dr. Farr's concise expression of the law of density. It is a correct and important practical deduction from the facts, but it must be applied with a clear understanding of the conditions thus bracketed together in one short expression. The basement of the law is this, that animal life contaminates its environments. In the process of living man defiles air, earth, and water. This defilement only becomes dangerous when his environment cannot cleanse itself, and this may happen either by shutting in the individual with some impervious structure or by the packing of individuals too closely together. But the aggregation of civilized men in communities involves not only the aggregation of their bodies but of their houses, and the erections required for the special businesses or employments, as well as the convenience, amusements, and other functions of their lives. All this means complicated structural obstructions to the access of air and sunlight. Some employments involve much more defilement of the surroundings than others. Manufactures entail smoke and noxious emanations of various kinds, differing in intensity and offensiveness according to the nature of the manufacture. From these considerations it follows—(1) that proximity does not begin to tell against health and life until it has passed a certain point; (2) that the same degree of proximity under different circumstances will have different degrees of injurious influence, *e.g.* in a market town, in a cotton spinning town, in a town depending on coal and iron industries. It is thus evident that an intimate knowledge of local conditions is necessary to make local comparisons of density, in relation to death-rate, consistent with the rules of inductive reasoning. The conditions of density must be the same in the localities compared.

But we must not exclude from review the practical object of the study of the laws of density in its relation to health. The conditions of density are the subject of the science and practice of Public Health; the efforts of sanitation are directed to the amelioration of the dangers of proximity. In certain degrees of intensity existing in towns, the units of the population live so near each other that the *conditions* of density cannot be ameliorated. It must be attacked directly by the clearing out of the buildings they inhabit and the dispersion of their inmates. But the great mass of sanitary work consists in the enforcement of provisions which neutralize or impair the evil effects of aggregation. In this way local density may remain and yet health may be improved, or over large areas it may steadily increase and yet the standard of health be maintained or even raised.

These considerations are admirably illustrated by the vital statistics of England for the last four decades. The following figures show that while by the steady growth of the towns and the proportionate decay of the rural element in the population, the areality and proximity of the total population have been rapidly shrinking, the death-rate has never risen in proportion, and has in the last decade, when this shrinkage attained its acme, fallen most decidedly :—

	Areality in Acres.	Proximity in Yards.	Mean Death-rate.
1841-50.	2·21	111	22·36
1851-60.	1·97	105	22·24
1861-70.	1·75	99	22·51
1871-80.	1·54	93	21·27[1]

You will be apt to under-estimate the value of a variation of a few modest decimals in the death-rate, but if you remember that in round numbers the mean population of England was 24 millions and a quarter in the decade 1871-80, you will not regard as insignificant an annual saving of 1.24 lives in every thousand in those ten years. It means 300,000 persons preserved to the nation ; and this after all merely suggests a long vista of the results associated with such a triumph of sanitation.

You will now understand how Dr. Farr's statement that " the duration of life being given in one set of conditions, the duration of life under another set of conditions is determined from the proximities " holds true only when applied to the data of large areas and within one period of time. In his first investigation, founded on the mortality in the registration districts of London, for the 4 years, 1838-41, he found that " the mortality of districts increased as the 6th root of their densities." but from the data of the decade, 1861-1870, for all England, he found that it was " nearly as the 12th root of their densities." Obviously from the tabular statement, just submitted to you, the law of one decade could not apply to another. Sanitation is operating upon the local conditions from year to year and unequally in different localities, but by taking large areas, these inequalities are averaged, and an improved standard of health, during one decade, is found with a diminished areality and proximity as compared with the decade preceding.

The physical conditions of density may be classified in general under four terms—air, earth, water, and the house. Density without sanitary interference and control deteriorates all four, and in the deterioration each acts and re-acts upon the other. It must therefore be remembered that their separate treatment

---

[1] 1881-90	1·29	85	18·62
1891-1900	1·15	80	18·06 (Ed.)

is more convenient than accurate. The common atmosphere is at once deteriorated by aggregation through the products of combustion in domestic fires and trade furnaces. The nature and quality of the fuel will modify this result of density: wood is less injurious than coal. Coal differs in smoke producing tendency. The stringency and enforcement or neglect of Acts for smoke prevention will produce local variations in the pressure of density upon health. The arrangement of the buildings, the width of streets in relation to the height of buildings, may be such as to promote or obstruct perflation of winds and general ventilation, so that the character of the local building regulations and their lax or stringent application will determine the influence of density upon health. So also with general police regulations as to paving and scavenging of streets and courts, and public cleansing in all its arrangements and detail. Here we pass into the region of Earth. If filth and garbage are allowed to lie about, especially in the vicinity of houses, upon the bare soil, the earth gets contaminated. Leaking sewers, drains, and gas-pipes, ashpits and conveniences with pervious bottoms, and otherwise defective in construction, all befoul the earth. The earth being foul not only does the air resting on it reek with poisonous emanations, but all water-supply derived from wells becomes impure, and the air drawn from it through the basement area of houses into the rarified space within is noxious. Rivers also soon become unfit for dietetic use in populous districts. We can thus recognize the supreme importance of such otherwise apparently insignificant details as the covering of courts and backyards with seamless pavement, the construction of ashpits and conveniences for the reception of filth so as to be impervious, preventing exudation and excluding rain, the frequent removal of their contents, and free use of water and the scavenger's broom, in relation to the purity of earth and air in densely inhabited districts. By the neglect of these precautions the conditions of density may be developed in their deadliest form; they may be minimized in direct proportion to the degree of stringency of their enforcement. Of all the noxious conditions of density not one can be so easily and so quickly removed as the impurity of the water-supply, and not one is so effective and certain in its baneful influence in all degrees of density. The inhabitants of a farm-house may in this respect be too near to each other just as truly as those of a large city though with far less excuse. The poisoned well in a rural district may be as deadly as the foul river from which a city derives its drinking water. But the diversion of the course of a leaky drain, or the tapping of a spring beyond the area of the farm-steading, will cure the one effect of proximity at the cost of a few shillings, while only a water scheme involving an expenditure of millions of pounds will cure the other. Let the farm or the urban district get a pure water-supply and this untoward incident of density is at once removed. In the proportion which it bears to the total incidence of density upon health in that locality Farr's law, that "the nearer people live to each other the shorter their lives are," is thrown out in its comparative local application. Still, in the remaining fractions of the total incidence it remains as effective as ever. There is no doubt that in rural districts it is through the water-supply that density is mainly operative as an element in health. There is no doubt also that the introduction of pure water into towns summarily shuts the most direct access of the baneful physical conditions of aggregation to the vitals of the inhabitants.

We have now arrived at the special subject of this paper—"*The house in relation to Public Health.*" I have adopted a somewhat circuitous route to get at my subject in order to associate it in your minds with the great law of density in relation to death-rate. The house is one of the most important items in the conditions under which density operates upon health. You can readily understand how in the case of cities, where aggregation assumes its highest value as an element in the physical conditions of health, if from any cause the efforts of sanitation have been unequally effective in modifying the conditions of density, that condition which has been *least* modified will predominate. That the housing of the inhabitants of cities has risen to this position of predominance in every aspect—social, moral, political, and sanitary—no one can question. Nor are the main causes of this difficult to discover. In itself the house-space must in any investigation of the relation of space in general to public health take a first place in importance. It is that portion of space which the householder acquires as his own. It is cut off and enclosed by its walls. He decides that this portion is, in his opinion, sufficient for himself and his family, or at any rate as much of this sufficiency as he can afford to pay for. Within it he acquires a personal right of ownership and liberty of action in the use of it, which cannot be invaded without ample justification on the ground of public necessity or utility. Yet men spend not less than a third, probably nearly one-half, on the average, women three-fourths, and children, in their earliest and most susceptible years, practically the whole of their lives within the house-space. Outside the house the collective mind of the majority or their representatives is all-powerful. A Water Act will improve the conditions of health of those who opposed as well as of those who promoted it; so will a rigidly-applied Smoke Act. Those precautions and operations of general sanitation, which I have previously described, benefit everybody whether they will or no. A good Building Act and Public Health Act may even secure that every house in the city is in itself sound in the physical conditions of health provided it be occupied and used in a proper way. But every householder has a freedom of choice of his house, and he may dislocate all the relations of health to house-space in the exercise of this freedom. In this way may a man's house not only express in the properties of space many things about himself, such as his social position, his moral character, his intelligence, but it provides, so to speak, a material leverage to those abstractions which enables them to act upon the health of all the inmates. The fact that a man is poor, or drunken, or ignorant does not shut him out from the benefits of pure water, pure external air, general civic cleanliness and sanitation, but singly or in combination they lead to his shutting himself and his family out of the blessings of a wholesome house. The result of these considerations is to prepare us for the fact that in cities the average house-space of the inhabitants has a closer relation to their average health than any other element or condition of health which is capable of statistical expression.

Here I must explain a curious difference in the use of words which exists between England and Scotland, which leads sometimes to much confusion in such discussions as the present. In England " house " has the meaning which " tenement " bears in Scotland, and *vice versa*. Hence the English data as to houses and their inmates are of no use as an indication of the house-space of families or persons; and as the English census gives no information as to the number of rooms in the house, which the Scotch census does, we cannot get for any English town the information which I am about to give as to the house-space of Scotch towns.

If we compare the death-rates of the eight principal towns of Scotland for the ten years 1871-80, with their densities, we find that there is no relation. The reason is that their areas are not populated throughout their whole extent. Glasgow has nearly built over the whole area assigned to it, but Aberdeen and Paisley have not. Consequently while the densities of Glasgow, Aberdeen, and Paisley are 84, 18, and 16 persons per acre, their death-rates are 29, 22, and 28. If we take house-space as the basis of comparison, we find that in every mode of statistical expression it moves closely with the death-rate. The eight towns may be divided into two groups of four—Aberdeen, Leith, Perth, and Edinburgh have death-rates ranging from 22 to 23; Dundee, Greenock, Paisley, and Glasgow from 26 to 29. In the former group there are from 1312 to 1671 persons per 1000 inhabited rooms, in the latter from 1870 to 2054. In the former group the proportion of the total population living in 1 apartment houses ranges from 10 to 17 per cent.; in the latter from 15 to 25 per cent. In the former group the proportion of the total population living in houses of 5 apartments and upwards ranges from 27 to 15 per cent., in the latter from 14 to 9 per cent. In the healthier towns, with a narrow limit of variation in death-rates, taken individually the house-space does not exactly follow those variations, but in the unhealthy with a wide range of variation, the house-space and death-rate move inversely with exactitude. Glasgow stands alone with the highest death-rate, the highest number of persons per room, the highest proportion of her population occupying 1 apartment houses, and the lowest occupying houses of 5 apartments and upwards. These facts prove beyond a doubt that the predominant factor in the health of cities is the proportion of house-space to inhabitants.

The relation between size of house as measured by number of apartments and the death-rate of these cities deserves special notice. You would observe that the proportion of the population living in 1 apartment houses is lowest in the healthy towns, highest in the unhealthy; while the proportion of the population living in large houses (5 apartments and upwards), is highest in the healthy and lowest in the unhealthy towns. The combined result of these two variables is expressed in the average number of rooms per house. This may be stated, so as to avoid decimals, as the number of rooms in 100 houses, which ranges in the healthy towns from 496 to 298, and in the unhealthy from 285 to 234. This relation between small houses and a high mortality and *vice versa*, is put beyond question by a laborious investigation made by Dr. Anderson, the Medical Officer of Dundee, who ascertained the number of persons living in houses of certain sizes in 1884, and classified the deaths for that year so as to determine the death-rate in those classes of the population for that year. He found that, without taking account of the deaths in the hospital or poorhouses and other public institutions to which the inhabitants of small houses retire to die, the mortality actually occurring in 1 apartment houses was 21.4 per 1000; in 2 apartment houses, 18.8; in 3 apartment houses, 17.2; and in houses of 4 apartments and upwards, only 12.3. It is a moderate estimate to suppose that if the deaths in institutions could have been distributed to the houses from which the persons were removed, the mortality in 1 apartment houses would have been found to be double that in houses of 4 apartments and upwards.

If we divide cities into districts, we find the same general relation between house-space and mortality. In Glasgow, for example, taking the statistics of the three years, 1880-1-2, and passing in review the 24 statistical districts into which it is divided, we find " Blythswood " and " Kelvinhaugh and Sandyford " at the top with the lowest numbers of inmates per room, the lowest proportions of one apartment houses, the highest proportions of large houses, the *lowest death-rates;* and the " High Street and Closes (E) " and " Bridgegate and Wynds " at the bottom with the highest numbers of inmates per room, the highest proportions of one apartment houses, the lowest proportions of large houses, *the highest death-rates.* In the intervening districts the relative movements of room-space and mortality do not exactly coincide, but the discrepancies are accounted for by variation in the actual value in cubic space of the unit " room " in the districts. The main cause of this variation is that houses erected at different periods follow a different scale of dimension of apartment. Taking the mean air-space in houses of 1, 2, and 3 apartments of various periods, it is found that in the oldest houses the mean value of the room is 1007 cubic feet, from which there has been a gradual rise to 1322 cubic feet in the most recent and best class of house. In the suburban Burghs, which are all of modern growth, the " room " represents a uniform scale of space, and consequently the death-rate is found to advance, *pari passu*, with the number of persons per room, from Pollokshields with only 627 persons per 1000 rooms and a mortality of 10, to Kinning Park with 2446 persons per 1000 rooms and a mortality of 23. Even in Glasgow, with all its local differences in the cubic value of the room, if we take the mean-house for the whole city and arrange the 24 districts according as their houses are above or below this mean in size and occupancy, we find that we have also got a fair division of the districts above and below the mean death-rate. If we take the mean size of house measured by rooms as the dividing line, we find that above it we have got the districts with low death-rates, and below it those with high. If we take the mean number of persons per room as the dividing line, above it we get the districts with high death-rates, and below it those with low.

The references which I have made to the uncertain value in cubic space of the unit " room " must have directed your attention to the weak point in this endeavour to establish a relation between house-space and health. The unit of house-space which I employ is " a room." It is the only standard of measurement available. The only exact unit is the cubic foot. If I could ascertain the cubic contents of every apartment in every inhabited house and divide the total by the number of inhabitants, I should then be able in one short statement to exhibit to you the relation of the house to Public Health. In the absence of this precise information, I am compelled to get as near to it as possible, and by various indirect paths to work out this relation. We have seen that the room varies in cubic capacity with the period of erection of the house. In older houses the average room is less capacious than in more modern houses; but the relation of house-space to health is not finally determined by the absolute measurement of the house-space, it consists essentially in the relation of this space to the number of persons living within it. Here again, instead of appealing directly to actual measurement of houses of different sizes, I must work round to an approximate answer to the question—What is the relation of cubic space to occupancy in large and in small houses as measured by the number of rooms? Does the same scale of occupancy prevail throughout? As you rise from 1, 2, and 3 apartment houses to houses of 5, 10, 15, and 20 apartments, do you rise in relative proportion in the number of inmates? The exact question, of course, is, have the inmates of large houses increased in proportion to the increase of house-space? or, is it the fact that the larger the house, the larger the average proportion of house-space to each inmate? The only available unit of measurement of house-space being the "room," I must ask you whether, as a matter of personal observation, it is not the case that the internal sub-divisions of a large house are larger than those of a small one? Take 1, 2, and 3 apartment houses to represent the small house. I can tell you as a matter of fact that in modern tenements the room is a constant unit measuring 1200 to 1300 cubic feet, so that the 2 and 3 apartment houses are as to cubic space simply multiples of the 1 apartment house. In older tenements there is a little gain per room in cubic space in the 2 and 3 apartment as compared with the 1 apartment house; while in the oldest, those in the High Street and Saltmarket, for example, there is a loss per room, *i.e.* the half or the third of a 2 or 3 apartment house is less than the 1 apartment house. But take your own eye-measurements of rooms in small houses and compare them with those of rooms in large houses, whether in flats or in self-contained lodgings, and I think you will grant me this proposition:—*The unit room in large houses has a much higher cubic value than the unit room in small houses.*

The next step in the process of induction through which I desire to lead you, I think I can prove. Referring again to the large towns of Scotland, I have calculated for each the average number of persons found at the census in each 1 apartment house and in houses of 5 apartments and upwards. To avoid decimals, I shall state the number of persons in 10 houses of each size. In Aberdeen there were in every 10 houses of 1 apartment 24 persons, in every 10 houses of 5 apartments and upwards 69 persons; in Leith there were 30, and 63 persons;

in Perth 23, and 68 persons; in Edinburgh 27, and 66 persons; in Dundee 27, and 112 persons; in Greenock 32, and 70 persons; in Paisley 34, and 75 persons; in Glasgow 31, and 78 persons. The number of persons per room and the number of rooms per average house is another aspect of the same facts. It is more complete, because it combines the average result of houses of all sizes in each town in one view. If we range the mean number of rooms per house in each town from the highest to the lowest, we find that the mean number of persons per room rises exactly as the mean size of house falls. At the top is Perth with 496 rooms per 100 houses, and 1312 persons per 1000 rooms; at the bottom is Glasgow with 234 rooms per 100 houses, and 2054 persons per 1000 rooms. We get the same inverse ratio between size of house and occupancy in the 24 districts of Glasgow and in the nine suburban Burghs. From these facts I deduce the following " Standard of Occupancy " :—*The smaller the house as measured by rooms the greater the number of inmates per room, and, vice versa, the larger the house as measured by rooms the fewer the number of inmates per room.*

Now, I have proved by actual measurements that the unit room in small houses of modern construction, which constitute the largest proportion of the total existing houses in Glasgow and large towns generally, and thereby make the law, is of nearly uniform size, so that 2, 3, and 4 apartments are multiples of the 1 apartment as to cubic space. You have granted the proposition that the unit room in large houses has a much higher absolute cubic value than the unit room in small houses, therefore, I make my last inference, that :—*The smaller the house the less the cubic space per inmate, and, vice versa, the larger the house the greater the cubic space per inmate.*

These are the laws which govern the relation of the house to Public Health. You will remember that in speaking of density, areality, and proximity in rural as compared with urban districts, I remarked that there was a certain range within which they became effective. Dr. Ogle has made reference to this fact in classifying the districts of England into groups according to their mortality in the ten years 1871-80. He begins with a group comprising rates under 15, and ends with a group comprising rates over 27, but under 34. It is not until we pass above a density of 217 persons per square mile, and a death-rate of over 19 and under 20 that the density and mortality move upwards together. He remarks :—" It is not apparently until the density has reached a certain degree of intensity that it begins to exercise any appreciable effect. This, indeed, might have been anticipated. For though we can readily understand that in crowded communities it may be a matter of vital importance whether there are 500, or 1000, or 2000, or more persons living on a square mile, yet it can scarcely make any difference, so far as health goes, whether in rural districts there be two acres or three acres on an average to each inhabitant. The differences in the death-rates in these sparse populations are determined by other conditions than aggregation." (p. xx.)

The same fact is apparent in house-space. It is only in the suburban burghs around Glasgow that we can find districts wholly of large houses and wholly of small houses, in both cases of modern construction. Pollokshields has houses averaging a little over 11 rooms, each inhabited by .627 persons, and a death-rate of 10. It is followed by Hillhead, with houses averaging between 6 and 7 rooms, inhabited by .830 persons per room, and a death-rate of 10.5. Crosshill comes next, with houses averaging between 5 and 6 rooms, occupied at the rate of .929 persons per room, with a death-rate of 12. Then follows Pollokshields (E.), with something over 5 rooms per house, 1.071 persons per room, and a death-rate of nearly 14. Afterwards the size of house diminishes, the persons per room increase, and the death-rate rises until we reach Kinning Park, with scarcely 2 rooms per house, between 2 and 3 persons per room, and a death-rate of 23.3. House-space seems therefore to become a predominant factor in the health of an urban district when we approach an average house of 5 apartments, and a mean occupancy of more than 1 per apartment. In short, there is an amount of space both inside and outside the house which is only a luxury, but when space in either case shrinks within a certain limit it becomes a necessary. In other words, *space is a commodity which is used only as a necessary of life by the wage-earning classes*, *but is used as a luxury by the wealthy.*

If we review these conclusions, to which I have led you step by step, it will be apparent that health and wholesomeness in small houses depend upon a very delicate adjustment of circumstances. The margin between health and disease in the structure of the house and in the use of its contained space is a very narrow one. The smaller the cubic space in which a man lives the more difficult it is, even with the *best* mechanical contrivances, to renew the air within it sufficiently without draught. In a laboratory experiment it has been shown that perfect ventilation of a space of 424 cubic feet can be maintained. With the best conceivable arrangements in a house, 600 cubic feet could be renewed sufficiently without draughts. These ideal conditions will give you some conception of how far short of perfection the ventilation of the ordinary small house must fall in practice, even with a carefully-regulated occupancy; but we have seen that the tendency to overcrowding grows as the house-space diminishes. The evidence that the supply of this necessary of life is in fact less than health demands is found in the mortality rising as the average space falls, and especially in the large proportion of deaths from diseases of the lungs in all urban communities where small houses most abound.

Let us run over the conditions required to secure the wholesome occupation of tenements of small houses. They must be carefully planned and built. Those small houses must start with the best practicable structural arrangements and sanitary provisions. There is no available margin of space about them which will neutralize any defects in original structure. Their contained air must be put in the best attainable circumstances both as to renewal and as to reducing contamination to a minimum by efficient drainage, water-supply, and the removal of refuse. Supposing such a tenement thus originally well-ordered, it must when occupied be carefully maintained. It works like an engine driven to the full extent of its horse-power. It is always bursting with life from roof-tree to foundation. Every part of its moveable working apparatus, and even its solid structure, is under strain. The inhabitants will not in general by their habits reduce the tear and wear, but "a stitch in time saves nine"; and it is not only necessary for health's sake, but economical for the proprietors, to be watchful and ready to maintain the structure and appliances of tenements of small houses. Supposing the structure and maintenance to be perfect, the mode of occupation must be regulated. The condition of wholesomeness lies essentially in the due proportioning of inmates to cubic space. The houses are in the market, but health is at stake in the choice made by the buyers. Every tenant in making his selection has on the one side of a line drawn by the laws of the universe, health, and on the other, disease. Experience proves that the occupants of small houses cannot be left to their freedom of action in this matter. There is a moral responsibility on the landlord in the first place, and failing him upon the authorities somehow to direct and determine their choice. Supposing this difficulty overcome, can the tenement thus properly built, maintained, and occupied, be left without supervision as to occupancy? I answer, no. Physical and moral chaos will gradually invade the original order if an eye, either the eye of the landlord or the sanitary inspector, is not kept upon the householders to prevent overcrowding.

Now, let us take the case of Glasgow, and for the sake of illustration consider what is done and what is left undone in promoting the conditions of health in tenements. As to their original structure, new buildings are erected under the powers of the Dean of Guild Court. These are notoriously defective.[1] I say notoriously, because repeated efforts have been made for years to have them extended and amended, but without success. Watch, for example, the Glasgow builder digging his trenches for the walls of his tenements and laying the joists of his basement floors over the grass or the bare soil. He cannot be compelled to clear away an open space, to put ventilating openings through the main walls into this space, much less to exclude the emanations from the soil by covering it with asphalt or concrete, or to prevent the surface water from passing up the walls by a damp-proof course. He need not show his drains and soil-pipes in his plans, and if he does he cannot be made to submit them to inspection before he covers them up. Time would fail me to enumerate the defects in our building regulations—these are a few examples. But it may surprise you to be told that a large proportion of our smallest houses are never submitted to any regulation at all. They are provided by a process known as "making down" large houses. The owner of a self-contained lodging or a tenement of large flatted houses finds that there is no demand for such accommodation in the locality; he forthwith throws open or takes off the front door, and lets the rooms of the large houses as one, two, or three apartment houses; he may even pass his plans for large houses, and next term begin the process of "making down." This process, carried on from time immemorial, has created the most puzzling of all the sanitary problems of house accommodation in Glasgow. We must pay now[2] in Improvement rates for the ignorance of our forefathers, but the pity of it is that we are helpless witnesses of the same mischief-making now. A tenement ought to be an edifice carefully planned for a certain mode of occupancy and number of inhabitants. You cannot alter the mode of occupancy and multiply the number of holdings and inmates without dislocating all the arrangement of parts and proportion of conveniences on which health depends. This is virtually the same as erecting a new building, and should necessitate the production of plans and the revision, under authority, of the whole tenement. At present a great part of the work of your sanitary department consists in improving such "made-down" houses when found to be "injurious to health," by the tedious, expensive, and unsatisfactory powers of the Public Health Act. This cannot be called rational from any aspect.

---

[1] The Buildings Regulations Acts of 1892 and 1900 to a great extent provided a remedy for the difficulties here noted.—[Ed.].

[2] The rate under the original Improvement Act ceased in 1890 but was re-imposed after the passing of the Act of 1897, one halfpenny being levied on owners and occupiers respectively. The Water and General Order (Confirmation) Act of 1902 gave power to raise the maximum assessment to 1¼d., and at present (1904-5) the amount levied is ¾d., divided equally between owners and occupiers.—[Ed.]

As to the maintenance of tenements by the summary removal of the defects technically termed "nuisances," which arise in the ordinary course of tear and wear, this is regulated by the Public Health (Scotland) Act, passed in 1867—twenty years ago! Not a line has been revised or a word added to the general health legislation of Scotland for twenty years! I need scarcely say a word more under this head. It appears to me that "nuisances" occurring in tenements have a special gravity as affecting the health of so many persons always living on the verge of disease, and the law should provide the most summary process that can be devised for their removal. Imagine what a leaking drain is below a 1 apartment house, or a choked W.C. on a common stair giving access to 12 or 20 houses.

As to the regulation and supervision of the mode of occupation of small houses, we are better off in Glasgow under the powers of our much maligned local Police Act. The principle is there fully admitted, that in small houses the margin between health and disease depends upon such a close adjustment of occupancy to space, that even in the choice and use of their houses, the householders must be controlled and regulated. In the local Act a minimum cubic space of 1, 2, and 3 apartment houses is fixed. Any such house may be measured, and if its total capacity does not exceed 2000 cubic feet, a ticket can be affixed on or over the outside of the door on which is marked the available space and the legal number of inmates. This is at the rate of 1 person aged eight years or upwards, or 2 below that age to every 300 cubic feet. In the older parts of the city, all houses which can be "ticketed" are so. In the newer parts when overcrowding is discovered, as it soon is by Fever, if by no other sanitary inspector, the landlord is first warned that if he retains such tenants his houses must be "ticketed." The tenants are at the same time advised to remove to larger houses. The inspection of these small houses is carried on at night all the year round. Many, however, are above the total cubic size which warrants ticketing; but if a house contains nightly lodgers, it comes under the Common Lodging-house regulations, provided the sum paid does not exceed 6d. per night; if it exceeds this amount, any house containing a lodger may be scheduled under the Public Health Act. The combined effect of these powers is, that a considerable proportion of the inhabitants of small houses live under close supervision, and many more are restrained by the fear of being subjected to this supervision. It will probably be news to many of you that at least 100,000 of your fellow-citizens live under physical conditions so perilously near to disease that the law has said those physical conditions must be prescribed and maintained. Every night in the year inspectors are out knocking at their doors, counting the people as they lie on their beds, or under them, or on the floor. It seems strange to think that under no other conditions can they be got to live in some measure of consistence with their own health and the safety of the community. In the overcrowded houses there are on an average 6 persons per room, of whom 1 or 2 are lodgers, and the average house-space is less than 200 cubic feet. The opinion of the authorities is, that the minimum size of 1, 2, and 3 apartments houses should be raised from 900, 1500, and 2000 cubic feet to 1200, 2000, and 2400; and that the standard of occupancy should be 400 instead of 300 cubic feet. We failed to get this and many other special powers necessary to the peculiar conditions of a large city through amendment of our Police Act, because the Lord Advocate desired uniformity, and we failed to get them through the Burgh Police Bill, because it was impossible to apply the same stringent laws in Auchtermuchty as in Glasgow! Even 400 cubic feet is a poor standard. In New York it is 600, and that in new buildings erected with a detail of attention to general structure, ventilation, drainage, and plumbing, as prescribed in the Tenement House Act, 1879, which might be studied by us with advantage.

Such is my idea of the method of securing fairly wholesome accommodation for the inhabitants of small houses. Let the houses be constructed with intelligent foresight of the conditions of health, let them be maintained with care and occupied with supervision, so that in their use they may not be made unwholesome. In geology there were at one time two rival theories in accordance with which it was sought to explain the facts. One was the paroxysmal or cataclysmic, the other the doctrine of uniformity. According to the former the configuration of the earth was worked out by spasms of excited action—the mountains were thrown up by earthquakes, and the plains laid out by deluges. According to the latter they were formed gradually by constantly acting forces of cold and heat, rain and wind, the gentle but not less powerful agencies which we still see everywhere active. In Public Health there are also two schools. The one is subject to periods of indifference and repose, then wakes up under the stimulus of some great epidemic or political revolution to the evils which have grown meanwhile, and plunges into paroxysms of eccentric activity. The other never sleeps, but works quietly from day to day, making and keeping things right. There is no department of public health in which those two schools exhibit their characteristics better than in that which deals with the housing of the poor. I belong to the uniformitarian school. If you fall asleep and leave the poor under the influence of their ignorance and improvidence to settle down into the nearest kennel, and allow the kennels to multiply, you soon have a condition of things which can only be removed by Improvement Schemes and gigantic displacements—thousands are thrown into the street at once. In such circumstances as those of London, where a community of four millions has the stable residential adjustment of its families suddenly disturbed, the result is to inflict untold hardship upon the poor. The social fabric is convulsed, and the " Bitter Cry of Outcast London " appals the ear. In despair the philanthropist develops all kinds of schemes, which the moralist and political economist condemns because of the greater evils which they see in the future. I have told you that a man's house expresses in space many things about himself, such as his social position, his moral character, his intelligence, and that it provides a material leverage to those abstractions which enables them to act upon the health of all the inmates. In short, we are living under moral government, and no one who looks beneath the surface of the misery of small houses can fail to recognise that there is in it a disciplinary element; there is, at anyrate, too much of this element to make it safe to attempt to remedy it from the outside; it must be remedied through the householder, by constant pressure upon the man as a rational and responsible being. Nothing will help him to thrift and self-restraint so much as the fact that there are no miserable houses to be had. It will always be that if there are miserable houses to be inhabited there will be miserable people to inhabit them; the two get together as certainly as drops of water coalesce if brought into proximity. There are streets and districts of tenement houses in Glasgow which are well up to the practical requirements of health, and the inhabitants are well up to the average standard of morality and well-ordered life. There are streets and districts of houses which are miserable in the material conditions of health, and their inhabitants are in the main like their houses—they have got together because the houses are there, and their ignorance and improvidence—often their vices and immorality—drive them there, and there they find congenial neighbours. As has been said :—" In crowded districts, where the lower orders are neglected and life is cheaply estimated, if tubs were ticketed ' to be let,' they would soon be tenanted by the most wretched." If we build houses at the cost of the ratepayers and give them to such people, we are relieving them, or most of them, at the expense of the well-doing, of the natural punishment of their ill-doing. If, on the other hand, we keep up the standard of house accommodation, we may lead the flagitious and improvident to mend their ways. The argument that insanitary houses must be permitted because only such are within the means of their occupants is like that for winking at the sale of adulterated and unwholesome food because the poor cannot afford better and will starve. Both arguments are most frequently advanced by interested parties—the owners of insanitary houses and the sellers of bad food.

It is a remarkable fact, that an essential part of every scheme for providing model dwellings for the wage-earning classes is the acknowledgment of this moral element in house accommodation. Not one of them provides for the actual inmates of the miserable houses—the people who are at the heart of all the social and sanitary troubles of cities. The tenants are selected. The model house is awarded to model people. They are strictly supervised by resident superintendents. No drunkard or vicious or immoral person is admitted or retained. All material nuisances are at once repaired. If every landlord so acted, the disciplinary results would in course of time be marvellous; if every local authority had summary power to weed out and keep down unwholesome houses, and systematically exercised it, the disciplinary results would in time change the aspect of life among the poor. Any exceptional cases of poverty, by no fault of its own, would be met by the charitable and philanthropic agencies working on their present moral basis. We should hear no more of the unwholesome house being a social necessity or of rate-supported schemes, which must either be administered so as to fly in the face of the moral government of the universe or so as to become nurseries of model parasites. In either case they would no more relieve us of our difficulties than the Republic of Plato, or More's Utopia, or the Hygeia of Richardson. The "Bitter Cry of Outcast London" was essentially an indictment against the Local Government of London, not a demonstration that although everybody—the legislature, the vestries, the landlords, the people—had done their duty somehow everything had gone wrong; the rewards had drifted into the hands of the vicious and the punishments had fallen upon the heads of the virtuous.

Gentlemen, when I was asked to appear before your Association I shrank from the honour, because it is but a limited range of subjects which I can venture to treat before such an audience, and within that range I could not think of any which would be interesting to you. When at last I chose my present subject, I felt it would appeal to you as men of education and position, or promise of position, in society. I ask you to accept it, not as a contribution to your professional knowledge, but as a humble endeavour to enlist your intelligent interest in the social problems of your age and city. The facts which have engaged us to-night form the soil through which creep the roots of revolution and social anarchy, drawing to them the noisome elements on which they feed. I have dwelt strongly upon the moral government of the universe—and we must remember that this includes the rich as well as the poor, the comfortable as well as the miserable, the respectable as well as the outcast. You may be selfish and have no thought of your poor brother, but you cannot get rid of him by not thinking of him. Brains hereditarily debased, and hearts full of gall and bitterness, are dangerous to the state. You live in a country which especially needs all the heart and brains of educated people in dealing with its social difficulties. You live in a city which, of all cities, bears the heaviest burden of civic responsibility. In Glasgow settle the lees of an enormous wage-earning population. Every facility for communication, the spread of intelligence in health matters, which moves first the best of the working-classes outwards, everything tends to leave us with a central mass of people who cannot be trusted to live without supervision and guidance. I hope what you have heard to-night will enable you to take a more intelligent and active interest in the details of our Local Government.

LIFE IN ONE ROOM.[1]

I shall not readily forget an incident in the delivery of the Right Hon. John Bright's Rectorial Address to the students of Glasgow University in 1884. He had discussed certain questions of the future, arising from the relations of this country to our colonies and dependencies and to foreign nations. Turning to home legislation, he thought to make his remarks more impressive by a reference to the condition of the inhabitants of the city in which his youthful audience was assembled, and in which a considerable proportion had been born. Mr. Bright said : "I was reading the other day a book which many of you have seen, called 'Past and Present.' In it there are some statements made from the Census of the Kingdom of Scotland. The writer states that in the City of Glasgow alone 41 families out of every 100 live in houses having only one room." The right hon. gentleman was immediately interrupted with cries of "oh ! oh !" and shouts of incredulous laughter ; whereupon he interjected the reminder—"That is the official statement of the Census" ; and went on to give further information about the homes of the people of Glasgow, which I shall not quote, as Mr. Bright took his figures from the census of 1871 instead of 1881, to which I shall subsequently refer. I said to myself—was there ever a better illustration of the proverb that one half of the world does not know how the other half lives? Here were facts which had been lying for 13 years in the Census Report, and which were not only unknown to the 2000 educated youths of the University, but which were so startling in their nature that when made known they were barely believed. Nay more. No passage in that long and eloquent address attracted more attention from the general public. The one and two roomed houses of Glasgow have almost passed into a proverb. They immediately became the subject of leaders in the newspapers, of speeches from statesmen, and the text of sermons. All thoughtful men were startled with the grave significance of those plain figures as to the physical and moral conditions under which our population lives. In short this passage set alight that flame of interest in the social circumstances of the poor which has spread over the land, and which, if the truth must be told, has been fed by facts which were perfectly well known to all men who in an official capacity or from special philanthropic impulses have been keeping touch with the poorer classes. Now, what does this prove? It proves that if the cup of cold water has not been borne to the parched lips, it is not because of want of sympathy, but because of want of knowledge. It is the old story—the mendicant who holds up his feigned distress to the public eye is sated with undeserved alms, while the poor man who hides his real sufferings at home is unnoticed and unrelieved. Carry him out to the wayside, or better still, go and search for him; and there is that divine impulse in the heart of humanity which will make men rush to his relief; even as, when we see a child stumble, our arms are around it before we are conscious of a throb of sympathy. This being so, I hold that it is our duty as Christian men and women to acquire that knowledge of our fellow-citizens which will give us a reasonable ground for determining the measure of our duty towards them. It is one of the blessed prerogatives of childhood to remain in happy ignorance of the anxieties and cares, the schemes and forethought, which fill the minds of those who maintain about them the comforts of their homes. For all they know to the contrary those comforts come to them with as little effort or design on the part of anybody, and are as far beyond the possibility of miscarriage, as the sun which cheers them at play. They will sleep in full assurance of awaking to their customary bountiful repast, while their parents are sleepless with the anticipation of reverse of fortune. But that which is natural in the child is thoughtless and even sinful in the man and woman. We ought to know something of the social machinery which is kept moving around us. We ought not because *our* bread and water are made sure lazily to take for granted that the bread and water of others give them as little concern. We ought not to preen and expand *our* virtues to the sun in our self-contained houses, putting them in proud contrast with the vices of those who live in the one-roomed house, without asking ourselves how far both the virtue and the vice are native to the physical circumstances in which we find them.

---

[1] A Lecture delivered to the Park Parish Literary Institute, Glasgow, 27th February, 1888, and published by request.

When my friend, your President, asked me to give you an address, it was by thoughts such as these that I was led to choose to speak to you of the City in which we live. You go about the streets of this great city day by day, and I wish you to have an intelligent sympathy with the life of it. A heathen poet said—"I am a man, and nothing that concerns man is without interest to me"; and surely if this was truly felt by a heathen nearly two hundred years before the birth of Christ, we who live nearly two thousand years after that divine expression of sympathy for man, must adopt the words with a fuller, richer meaning. You have experienced the change which passes over our relations to a man as we come to know something about him. We see him day by day taking his place opposite us at the desk, or his seat beside us in the pew, or we meet him from time to time in the tramcar, or pass him as we walk to business at a certain corner of a street. Bit by bit we come to know where he lives, what he does, what his social circumstances are. The man ceases to be a pale abstraction, and in short becomes to us really a man. I cannot in the same sense make you to know the men and women of Glasgow. I can only build up in your minds by the aid of a few figures and general facts, some notion of the physical circumstances of an impersonal average inhabitant. When we think of a citizen of Rome or of Athens, we have before us the outlines of a being whose home-life and occupation and amusements and general surroundings we could describe. Let us see whether we cannot so distinguish in our thoughts the citizen of Glasgow from the citizens of other cities in the country.

The point of time to which my statements refer is the 4th of April, 1881, when the census was taken, and nothing capable of expression in figures as to the condition of the population was left to surmise. The inhabitants of Glasgow numbered 511,520 souls. The area of the earth's surface on which they lived extends from E. to W. 5 miles, and from N. to S. fully 3 miles, and contains 6111 acres or fully 9½ square miles. These data enable us to work out the most important physical fact in the condition of men in the aggregate, viz. the proportion of their number to the extent of the earth's surface on which they live. A man may learn to exist without air for several minutes if he wishes so to distinguish himself; a man may live for several days without food; and clothing is not at all essential to life, but *space* to live on and in is an absolute necessity. I do not wish to be led into a discussion of "the rights of man" as a citizen, but it is well now-a-days to remember this at anyrate, that if man has any rights at all, one of them certainly is—the right to enough of the area of the earth's surface to afford him standing room, and enough of the cubic space of air thereon at least to crouch in. You may call it a luxury to give him room to lie down in, and space to stretch himself in, but to deny him standing and crouching room is to say in the laconic language of Aytoun's ballad, "You shall not exist for another day more!" In the phraseology of vital statistics the proportion of population to the earth's surface is called the "density" of that population. In Glasgow the density is 84 persons per acre.[1] The exact meaning of this statement is, that if the whole population were distributed equally over 6111 acres, there would be on each acre 84 persons; or if each person were assigned his own share of this acre it would of course be the 84th part of an acre, or about 58 square yards. The significance of this fact can be brought home to your minds only by comparison with other cities. There is only one city in Great Britain which exceeds Glasgow in density, and that is Liverpool, where there are 106 persons to the acre. The only city which approaches Glasgow in density is Manchester, where there are about 80 persons to the acre. The density of London is only 51, and of Edinburgh only 55. Excepting Greenock and Edinburgh no other town in Scotland exceeds half the density of Glasgow; most are far below that figure.

Let us endeavour to unfold to you somewhat the meaning of this first fact concerning the average citizen of Glasgow—that he has less of the earth's surface on which to live than the citizen of any city save one in the kingdom. This area gives us the proportion of the universal bounties of nature which he enjoys. The vertical space of the general atmosphere rests upon the 84th part of an acre on which he stands. We measure the sunshine and the rainfall by this area. Nor do we fully represent the state of the case if we infer that the inhabitant of the city gets a smaller share of the full quantity of these bounties of nature. The denser the city is, the more befouled is the earth with organic impurities; the thicker becomes the canopy of smoke which cuts off the sunshine; the fouler are the rain and the streams and springs which traverse the earth. The self-purifying functions of soil and air and water are overpowered by the amount of the work thrown upon them and the unnatural circumstances under which it has to be attempted. From these disadvantages of density therefore Glasgow suffers beyond all other cities, and as I have elsewhere said: "Altogether we are as far shut out from the ministry of nature as the necessities of the case, combined with the aggravations of human ignorance, perversity, and wilful self-aggrandisement can place us."

---

[1] The "density" at the census of 1891 was 93, but by the inclusion of the added areas in November of that year it was reduced to 56, and in 1901 (census was 60 per acre.—[Ed.]

I have said that this element of density is calculated upon the assumption that all persons are equally distributed over the area of the city, each standing in the centre of his or her own plot. On this supposition another fact may be worked out, which is—the average "proximity" of each person to his neighbour. This is simply the length of a straight line drawn from the centre of one plot to the next. In Glasgow this is slightly over 8 yards. You will understand at once that the proximity must vary exactly as the density, and therefore in Glasgow we are on the average nearer to each other than in any city save Liverpool. This means that in the various relations of our lives we are more apt to jostle against and interfere with one another, either for good or for evil. As I confine myself at present to physical relations, it is obvious that we are more apt to interfere with one another to our mutual disadvantage. This is absolutely and universally true as regards physical evil. Take infectious disease as a typical illustration. Throughout the community as a whole, infection, which means the passage of a material something from person to person, must take place in proportion to their average proximity. If that is in Glasgow 8 yards and in Edinburgh 10, then the chances favourable to infection in Glasgow must be in that proportion greater than in Edinburgh, unless indeed by greater care in the treatment of cases of infectious disease we diminish those chances.

Now let us turn to the class of facts upon which Mr. Bright touched. As a matter of fact, the population is not equally distributed over the area of any city. The space in which people really live—that space the extent of which most influences their health and comfort, and even conditions the moral relations of their lives—is the space which is their own, viz. their house-room. The extent of this space or the size of the house determines the local density. While the average density of all Glasgow is 84 persons per acre, the local density varies from 26 to 348, in the 24 sanitary districts into which the city is divided. You can apply for yourselves to these facts all that I have said as to the evils of density. If we classify all the houses in Glasgow, we find that in every 100 there are 30 of only one apartment, 44 of only two apartments, 15 of three, and only 5 of five apartments and upwards. This enormous proportion of small houses will sufficiently explain the low average rental of a Glasgow house. The hovels of the East completely swamp the palaces of the West, and produce an average of only £11 6s. 9d. The size of this average house is only 2.3 rooms, each occupied by 2 persons fully (2.042). The highest average of rooms per house in any district is a little over 4; the lowest considerably under 2.[1] The highest average of inmates per room is about 3; the lowest 1¼. I am unable to give you parallel statements regarding any other city, because the data have not been worked out. Indeed, the materials do not exist excepting for Glasgow, so that I may ask you to note this fact, that the authorities of Glasgow have a minute knowledge of the physical condition of their people which no other authorities possess, and therefore ignorance cannot be pled in extenuation of any backwardness in improving this condition. I can, however, give you the exact comparative position of your city among the eight chief towns of Scotland as regards the proportion of their populations living in the various sizes of house. Mr. Bright gave the proportion of families, but it is of more importance in estimating the extent to which the advantages and disadvantages of house-room are imposed upon the population to ascertain the proportion of individuals. Of the inhabitants of Glasgow, 25 per cent. live in houses of one apartment; 45 per cent. in houses of two apartments; 16 per cent. in houses of three apartments; 6 per cent. in houses of four apartments; and only 8 per cent. in houses of five apartments and upwards. There is no town in Scotland which has so large a proportion of its population living in one-room houses. There is no town in Scotland which has so small a proportion of its population living in houses of five rooms and upwards. In Edinburgh, above 27 per cent. of the people live in houses of five apartments and upwards, and only 17 per cent in houses of one apartment. The dreadful struggle for life in Glasgow as compared with Edinburgh is shown by the fact that in Glasgow one-room houses contain more inmates on the average than in Edinburgh, and the large houses fewer. But even in Glasgow there are only 7.8 persons in the large houses as compared with fully 3 in the one-room houses—a difference in the physical circumstances of these two classes of citizens which alone places them far as the poles asunder in respect of the preservation of health and the opportunity for purity of life. I am anxious to emphasize this difference by the accumulation of facts which can be expressed in cold figures. Figures are beyond the reach of sentiment, and, if they are sensational, it is only because of their terrible, undisguised truthfulness. You must not think of the inmates of those small houses as families in the ordinary sense of the term. No less than 14 per cent. of the one-roomed houses and 27 per cent. of the two-roomed contain lodgers—strange men and women mixed up with husbands and wives and children, within the four walls of small rooms. Nor must I permit you in noting down the tame average of fully 3 inmates in each of these one-apartment houses to remain ignorant of the fact that there are thousands of these houses which contain 5, 6, and 7 inmates, and hundreds which are inhabited by from 8 up even to 13!

---

[1] The 1901 census showed a tendency towards increase in the average size of house and reduction in the average number of persons per room.—[Ed.]

Percentages, though an accurate, are but a feeble mode of expression for such facts regarding men and women like ourselves. I have told you that in 1881 the population of Glasgow was 511,520 persons, and that of those 25 per cent. lived in one-room, and 45 per cent. in two-roomed houses; but what does that mean? It means that 126,000 persons *live* in those one-roomed, and 228,000 in those two-roomed houses. But is that all I can say? I might throw down that statement before you, and ask you to imagine yourselves, with all your appetites and passions, your bodily necessities and functions, your feelings of modesty, your sense of propriety, your births, your sicknesses, your deaths, your children,—in short, your *lives* in the whole round of their relationship with the seen and the unseen, suddenly shrivelled and shrunk into such conditions of space. I *might* ask you, I *do* ask you, to consider and honestly confess what would be the result to you. But I would fain do more. Generalities are so feeble. Yet how can I speak to you decently of details? Where can I find language in which to clothe the facts of these poor people's lives, and yet be tolerable? The words of Herr Teufelsdröckh, when at midnight, from his attic lodging, he looked down upon the town of Weissnichtwo, will help me a little. He said to his friend—"Oh, under that hideous coverlet of vapours, and putrefactions, and unimaginable gases, what a Fermenting-vat lies simmering and hid! The joyful and the sorrowful are there; men are dying there, men are being born; men are praying,—on the other side of a brick partition men are cursing; and around them all is the vast, void Night. . . . Wretchedness cowers into truckle beds, or shivers hunger-stricken into its lair of straw; in obscure cellars *Rouge-et-Noir* languidly emits its voice-of-destiny to haggard, hungry villains. . . . Riot cries aloud, and staggers and swaggers in his rank dens of shame; and the mother, with streaming hair, kneels over her pallid, dying infant, whose cracked lips only her tears now moisten.—All these heaped and huddled together, with nothing but a little carpentry and masonry between them; crammed in like salted fish in their barrel; or weltering, shall I say, like an Egyptian pitcher of tamed vipers, each struggling to get its *head above* the others : *such* work goes on under that smoke-counterpane !"

It is those small houses which produce the high death-rate of Glasgow. It is those small houses which give to that death-rate the striking characteristics of an enormous proportion of deaths in childhood, and of deaths from diseases of the lungs at all ages. Their exhausted air and poor and perverse feeding fill our streets with bandy-legged children. There you will find year after year a death-rate of 38 per 1000, while in the districts with larger houses it is only 16 or 17. Of all the children who die in Glasgow before they complete their fifth year, 32 per cent. die in houses of one apartment; and not 2 per cent. in houses of five apartments and upwards. There they die, and their little bodies are laid on a table or on the dresser, so as to be somewhat out of the way of their brothers and sisters, who play and sleep and eat in their ghastly company. From beginning to rapid-ending the lives of these children are short parts in a continuous tragedy. A large proportion enter life by the side-door of illegitimacy. One in every five of all who are born there never see the end of their first year. Of those who so prematurely die, a third have never been seen in their sickness by any doctor. "The tongue of the sucking child cleaveth to the roof of his mouth for thirst; the young children ask bread and no man breaketh it unto them." Every year in Glasgow the deaths of from 60 to 70 children under five years of age are classified by the Registrar-General as due to accident or negligence; and it is wholly in these small houses that such deaths occur. Half of that number are overlain by drunken mothers, others fall over windows and down stairs, are drowned in tubs and pails of water, scalded, or burned, or poisoned with whisky. I can only venture to lift a corner of the curtain which veils the life which is lived in these houses. It is impossible to show you more.

These are some of the worst fruits of life in the one and two roomed house, the ultimate products of that degeneration, moral and physical, which proves that the whole bias and tendency of life there is downwards. But let us ask ourselves what life in one room can be, taken at its best. Return to those 126,000 men, women, and children, whose house is one apartment, and consider whether, since the world began, man or angel ever had such a task set before them as this—the creation of the elements of a home, or the conduct of family life within four bare walls. You mistresses of houses, with bed-rooms and parlours, dining-rooms and drawing-rooms, kitchens and washing-houses, pantries and sculleries, how could you put one room to the uses of all? You mothers, with your cooks and housemaids, your nurses and general servants, how would you in your own persons act all those parts in one room, where, too, you must eat and sleep and find your lying-in-room and make your sick-bed? You fathers, with your billiard-room, your libraries and parlours, your dinner parties, your evening hours undisturbed by washing-days, your children brought to you when they can amuse you, and far removed when they become troublesome, how long would you continue to be that pattern husband which you are—in one room? You children, with your nurseries and nurses, your toys and your picture books, your space to play in without being trodden upon, your children's parties and your daily airings, your prattle which does not disturb your sick mamma, your special table spread with a special meal, your seclusion from contact with the dead, and the still worse familiarity with the living, where would you find your innocence, and how would you preserve the dew and freshness of your infancy—in one room? You grown-up sons, with all the resources of your fathers for indoor amusement, with your cricket field and football club and skating pond, with your own bed-room, with space which makes self-restraint easy and decency natural, how could you wash and dress, and sleep and eat and spend your leisure hours in a house of—one room? You grown-up daughters, with your bed-rooms and your bath-rooms, your piano and your drawing-room, your little brothers and sisters to toy with when you have a mind to, and send out of the way when you cannot be troubled, your every want supplied, without sharing in menial household work, your society regulated, and no rude rabble of lodgers to sully the purity of your surroundings, how could you live and preserve "the white flower of a blameless life"—in one room? You sick ones, in your hushed seclusion, listen to Charles Lamb's description of you:—"Household rumours touch him not. Some faint murmur, indicative of life going on within the house, soothes him, while he knows not distinctly what it is. He is not to know anything, not to think of anything. Servants gliding up or down the distant staircase, treading as upon velvet, gently keep his ear awake, so long as he troubles not himself further than with some feeble guess at their errands. . . . He opens his eye faintly at the dull stroke of the muffled knocker, and closes it again without asking—'Who was it?' He is flattered by a general notion that inquiries are making after him, but he cares not to know the name of the inquirer. In the general stillness and awful hush of the house, he lies in state and feels his sovereignty." How would *you* deport yourself in the racket and thoughtless noise of your nursery, in the heat and smells of your kitchen, in the steam and disturbance of your washing-house, for you would find all these combined in a house of—one room? Last of all when *you* die, *you* still have one room to yourself, where in decency you may be washed and dressed and laid out for burial. If that one room were your house, what a ghastly intrusion you would be! The bed on which you lie is wanted for the accommodation of the living. The table at which your children ought to sit must bear your coffin, and they must keep your unwelcome company. Day and night you lie there until with difficulty those who carry you out thread their tortuous way along the dark lobby and down the narrow stair through a crowd of women and children. You are driven along the busy and unsympathetic streets, lumbering beneath the vehicle which conveys your scanty company to the distant and cheerless cemetery, where the acrid and deadly air of the city in which you lived will still blow over you and prevent even a blade of grass from growing upon your grave.

I think you will agree with me in this inference, that in the city in which we live there is great room for the development of practical Christianity. There is probably no better field in the three kingdoms for those who would imitate Christ in ministering to the bodies as well as to the souls of men : and there is no hope for the people who live in one and two roomed houses unless the Church, which is the healing hand of Christ still present in our midst, becomes the motive power in society, directing our rulers to wise public measures, and stirring the hearts of individuals to private beneficence. The question for us is, what can we do? The solution of the social problems of the age is for us the doing of something here and now. Our lives are fleeting : the lives of those who furnish the problem are fleeting, and if we act not now, we shall be " unprofitable servants," and those we might have profited will rise up in the judgment against us.

It is obvious that no manner of occupancy will make a one-room house a home in the proper sense of the word. Not that many an isolated man or woman or aged couple may not find in it a wholesome and suitable dwelling-place, and enjoy therein the privilege of independence. Even the young couple who have " married for love " while yet in the stage of " working for sillar " may light their first fire on the hearth of the one-room house. These are the anomalies of life, and under certain conditions I take no exception to the one-room house in itself, because it undoubtedly meets them ; but, I repeat, a home in the proper sense of the word, a place for the nurture of a family it can never be. Therefore there is among us a large population which is, from whatever ultimate cause, absolutely debarred from the requisite physical conditions even of the lowest standard of home comfort, and which is always on the inclined plane of moral deterioration. We may discuss, if we please, the question whether there ought to be such houses, whether it is necessary that there should be such houses, whether their existence depends upon inadequate wages, or the mis-spending of adequate wages. Indeed these questions ought to be discussed; but let us not meanwhile forget that there they *are*, and that human beings are living in them under the physical and moral disadvantages described, and we are bound to endeavour to make their lives happier and better. I venture to believe this very endeavour is the most natural and most likely way bit by bit to do away with one-room houses, by recognizing that their inmates are our brothers and sisters, and so elevate their aspirations and restore them to self-respect. If we deny them this recognition I see no prospect for them but degeneracy into "Dead Sea apes," or something worse! It is encouraging to know that Glasgow is improving. In 1861 there were in a much smaller population 145,000 persons living in one apartment. There are now, as I have said, 126,000; and there is a corresponding increase in the inhabitants of houses of two and three apartments. We are therefore moving in the right direction, and that not by any revolutionary force from without, but by a higher standard of life growing in the minds of the people. Still the inhabitants of those small houses require our active Christian sympathy and assistance, and in a city which is the greatest aggregation of working people with the smallest admixture of the wealthy class to be found in this country there will always be this necessity.

Here let me interject a word on areas of local government in relation to social helpfulness and sympathy. Local government is the expression in administration of community of interest. Men are not driven together by fortuitous gusts like heaps of dead leaves. The locality of the city is determined by the satisfaction of some motive purpose—the shelter of the castle or the monastery, the stream favourable for traffic, for manufactures, the port for trade, the many various incidents of place which tempt the migrant to become the settler. So by harmony of motive aggregation goes on until in time comes the sense of the need of local government. A boundary must be defined, and it is drawn around the whole community; but frequently the community increases and overflows this boundary. Clearly there ought to be some automatic method of from time to time including these overflows, and so preserving unity of government in that which is essentially an organic whole. Unfortunately, boundaries have political as well as social importance, and are the subjects of gerrymandering; and so our lawgivers regard questions of boundaries with an eye to political issues. Within the family, which is the unit of society, there is mutual helpfulness and interdependence. Between one family and another in a community there is mutual helpfulness and interdependence. If it were not so communities never would have existed. Where, in the aggregation of families and householders on one soil, under the expanse of one sky, in the soft embrace of one atmosphere, shadowed by the same passing cloud, or made bright by one sun, smitten by the same disease or adversity, rejoiced by the same health or prosperity, where can we safely permit the erection of an administrative barrier, and say, here the necessity for this practical sympathy and co-operation ceases? "What God hath joined together, let not man put asunder." Social philosophy and social morality alike demand unity in the civic life, formal, corporate unity. If the employers have hived off to the west and built themselves suburban villas; if the skilled artizans and mechanics have gathered in colonies, north, east, and south; if the old parent city has gradually become little more than a workplace, the centre of commercial life and the seat of the power which drives the complicated machinery of the communal activities, where she sits surrounded by the hewers of wood and the drawers of water, by the prodigals of her family, the bankrupt in fortune and the criminals, how distraught is the community! Does the political economist ask information as to the amount and the incidence of municipal taxation, as to the prevalence of poverty or crime and the expenditure in poor-rates and police, as to the state of labour, the number of unemployed and the method of providing for them. He can get no information which is not misleading. Does the statistician wish to follow the movements of the marriage-rate, the birth-rate, and the death-rate? The figures we supply are not those of the community at all. If the sociologist attempts to reason upon them he is sure to stumble into fallacies. Water-supply, gas-supply, hospitals, tramways, all those developments of municipal co-operation for the more efficient and economical satisfaction of common needs are essentially crippled in their application. Police, cleansing, sanitation, sewerage, and all the ordinary objects of local government are made more difficult of attainment. Taxation of every kind being sectional is unfair. The strong do not share the burdens of the weak. In one body, traversed by the same system of arteries and veins and nerves, there can be no such thing as a local benefit or a local injury. In such a distraught community as I am describing the local benefit so-called becomes a local injustice. Parks, museums, picture galleries, everything provided by local money for public use is unavoidably enjoyed by those who do not contribute to the cost or maintenance. There is a constant antagonism in the minds of the several authorities between the broad dictates of state craft and the narrow impulses of parochialism. Some sense of the good of all moves blindly towards the former, but jealousies, rivalries, and the necessity of maintaining a show of local patriotism determine the supremacy of the latter. Glasgow has done much to supply by taxation those physical accessories of small houses which dwellers in large houses provide for themselves, which from mere want of space the poor cannot have, but which, if they are indeed brothers and sisters, they require as much as the rich. Taxation for such purposes is eminently Christian in motive and effect. It may be called Christian Socialism. All contribute, but the well-to-do are not taxed directly for their own benefit, although it is to be hoped we recognize the truth of one of those sayings of the late Prince Leopold which make us regret his untimely death—"Along the ways of wisdom and virtue we shall all advance further, if we all advance together."

Our public baths and wash-houses are the best and most ample in the country. Every inmate of a small house may find there those conveniences for private ablutions which cannot be got at home, and the women may, at a trifling cost, avoid turning their homes into washing-houses. Our model lodging houses help to lessen the horrid evil of lodgers in small houses. The sick, in so far as their sickness arises from infectious disease, have access without special charge to what is the finest Fever Hospital in the country, and infected clothing, &c., is removed, washed and returned clean as punctually and carefully as by any commercial laundry company. We still require public mortuaries to lessen the necessity for the ghastly presence of the dead in the one-room house. Our parks, galleries, and museums furnish means of recreation, culture and instruction, but we have no system of Free Libraries bringing books and quiet room for study to every district of the city. There is also a sad want of play spaces for the little children in Glasgow. I shall have something more to say on behalf of the children when I come to speak of various forms of private beneficence, but I wish our authorities would think a little more of the toddling "things" who cannot walk to our parks, and whose mothers have not time to carry them thither. One often stumbles over them creeping about dark lobbies, and many a time one has to pick his steps carefully, so as not to interfere with their attempts to play at houses on the stairs. If they venture further they will find only the dead air and nauseous environments of the back courts, or the dangerous street. Probably the Glasgow boy is the wildest, most destructive specimen of a boy in existence, and why? It is a law of child-nature to be constantly moving, constantly doing something, and what can a poor boy do in Glasgow but pull the bricks out of the walls of the ashpits, or climb on to the roof and tear off the slates. The landlords complain that the police do not protect their property. If they would not be so greedy of the soil, but provide more space for innocent games, the evil would be cured. I need scarcely say that I sympathize with the poor boys more than with the landlords. I also think that a few open spaces here and there, made clean and smooth with asphalt or granolithic, where boys could spin tops and little children could sprawl about in safety, would serve the necessities of the rising generation better than the parks. There also, some area, clear of shrubs and flower-beds ought to be preserved for young men. Where can working lads go to get a game at football or play at cricket? The young men of the West-end expend large sums of money to obtain space for these recreations; and even they are every year driven further away and put to greater expense. It is sad to see the poorer lads lounging at the close-mouths, when they ought to be developing their muscles, and acquiring that love of out-door sport which is the best antidote to the temptations of the music hall, the dancing saloon, and the dram shop. Yet, what can they do? Their poor pence will not suffice for the rent of a field, and they ought to be supplied out of the public funds. Let us have public gymnasia; and, if we are to be breeders of men and not of vicious loafers, do not let us confine our efforts to the growing of grass in our parks and the luxury of looking at it over an iron railing.

Now, let us turn to the development of practical Christianity by private effort. Hospitals for the sick are the special product of Christianity. Ulhorn[1] tells us that in Pagan Rome and Greece—" There were no poorhouses and no hospitals. Lazarettos in the Roman Empire were curiously enough known as places for soldiers and slaves only. Antoninus Pius indeed tells us that he had built beside the temple of the Epidaurian Æsculapius, a building for the reception of the sick. But this was not a hospital. It was rather a kind of hostelry for those who had come to pray to the god on account of their sickness" (p. 14). He adds—" They had not charity." Glasgow is well supplied with general hospitals; but not too well. Their resources are drawn upon to meet the wants, not of Glasgow merely, but of the enormous working population of Lanarkshire. Another is about to be built on the south-side.[2] I do not think these hospitals are supported as they ought to be by the public of Glasgow. If the miseries of sickness in small houses were more vividly before the public mind, I am sure the benevolent gentlemen who give so much of their time to the management of those institutions would not be worried as they constantly are about their finances. They require more of the shillings and half-crowns of the middle classes. There is no way in which money can be charitably bestowed with less risk of being misapplied.

---

[1] *Christian Charity in the Ancient Church.* Edinburgh, 1883.

[2] The Victoria Infirmary here referred to was opened in 1890 and enlarged in 1893.—[Ed.]

But when thinking of the physical disadvantages of small houses as a subject of benevolent help and alleviation, what comes to my thoughts with ever recurring persistence is the dull, dead, unrelieved monotony of the conditions of life within them and around them. Mr. Buckle wrote a history of civilization, the philosophy of which was that in form and character civilization was determined by the influence of physical agents —climate, soil, food, and the general aspects of nature—on the races of mankind. Under general aspects of nature he contended for "the influence exercised by the external world in pre-disposing men to certain habits of thought, and thus giving a particular tone to religion, arts, literature, and, in a word, to all the principal manifestations of the human mind." Buckle went too far in his desire to make the moral and spiritual nature of man entirely the product of external and material agencies; so that, soul and body, he must change with the flora and fauna of his district. But it is certainly true that the physical surroundings even of the individual man will leave their mark on his soul as well as on his body; and the one result may be as regards his individual responsibility, as inevitable as the other. Place 126,000 human beings in one-room houses, and 43,000 in houses of five rooms and upwards, and, no matter who or what they are, you have at once determined for them much both of their moral and physical future. If their course is downwards, the one class has further to fall than the other before both reach the same depth. If their course is to be upwards, the one class has not so far to rise as the other before both reach the same height. All through life man divides his time between work and sleep and play,—play including all ways of spending those hours which are not absorbed in work and sleep. The education of the child and the toil of the adult are *regulated for him*, and imposed upon him. The *play* of both is in its character *a matter of choice*, and nothing shows more clearly the inner nature than the nature of the play. But the nature of the play is very much a matter of education and of opportunity; and the opportunity of the child is the education of the adult. If the child has only the dark lobby and the stair to play in, then the man and woman will find amusement only in the dram shop, the music hall, and the dancing saloon. The gutter child grows up into the loafer. The hard-working man when he gets a holiday does not know how to spend it. Even when he finds himself in the country, he has frequently no eye for the scenery, or for the beauties of the grass and the flowers. He carries too often a bottle of whisky in his pocket, and he makes himself an object of alarm and disgust. The hard-working woman either joins in the debauch or thinks no shame to be seen in the company of intoxicated men. There is no way of forming a just opinion as to these habits of the inhabitants of our small houses, but by calmly and conscientiously analyzing what I might call the physics of our own morality. If Buckle has successfully proved regarding mankind in the mass, inhabiting different regions of the earth, that there is an "influence exercised by the external world in pre-disposing men to certain habits of thought, and thus giving a particular tone to religion, arts, literature, and, in a word, to all the principal manifestations of the human mind," and I believe he has, then is it possible that the one and two roomed house piled up in tenements, and these tenements again ranked in streets and packed into back courts, can produce the same manner of men as the large houses with all the luxurious space and opportunity of the softening ministration of nature *without*, and the tender wooing of light and warmth and comfortable domesticity *within?* I confess for myself that the physical circumstances of the poor in Glasgow are so contrary in their nature to those which have surrounded me throughout my life and I recognize such a close relationship between my physical circumstances and the general character of my life, that I can come only to one or other of two conclusions: Either the poor belong to a different species of the genus man, or the same relationship must exist between *their* different physical circumstances and the different general character of *their* lives.

I feel that I am occupying your time too much with general philosophizing. I have striven to lead you into an intelligent view of your relations as Christians to the city in which we live. I plead for general helpfulness to enable the inhabitants of the one-roomed houses to bear the burdens of their lives. I must leave you to find out for yourselves the various methods which may lie to your hands and be adapted to your individual circumstances and capacities, of working in the general direction which I have indicated. I commend to your kindly interest and Christian liberality the Association for Nursing the Sick Poor at Home, the Kyrle Society, the Day Nurseries, the Day Feeding Schools, Poor Children's Dinner Tables, Flower Missions, Fresh-air Funds, Foundry Boys' Association, and the like. I put in a special word for the children because of their essential helplessness, and because they are the men and women of the future. It is so easy to make a child happy. If you only take a few poor children to the country for a day, or admit them to a garden or a plot of grass for an hour or two; or gather a few together on a winter's night and show them a magic lantern, or play to them and teach them a lively game, or sing a nursery rhyme, or tell them a nursery story, their happiness is secured. I read lately the life of Paul Merritt, a man who was born in the most miserable circumstances, but who grew up to be a well-known art critic; and the first awakening of his faculty was a peep through a keyhole into a garden. He writes—"I was in my eleventh year, meanly clothed, poorly fed, and penniless—an errand-boy in receipt of 1s. 6d. a week." He discovered a garden, peeping with a boy's curiosity through the keyhole in the tall wooden gate. "I looked through the keyhole every time I passed and that was four times daily, and always with increased interest, for my flowering aconite. But oh! trouble upon trouble, one day I found the keyhole stopped, and there was an end of my daily joy and of the interest which had awakened in me a new craving for the wonders of nature." A few days after, grubbing among the rubbish thrown out from this garden he found a budding something which seemed to him to have "the promise and potency of life," though of what sort he knew not. He nurtured it in an old teapot, and it shortly burst out—the first crocus he had ever seen. Years after, when surrounded with beauty in his studio in London, he described how—"one sunny, silent, Sunday morning, this crocus opened its golden glowing sacramental cup, gleaming like light from heaven, dropped in a dark place, living light and fire." Let this experience teach you by what simple means—a flower, a song, one bright day in the country—child-nature may in its growth be turned upwards towards the light.

I have now in a way very fragmentary and not at all satisfactory to myself, but the only way possible to a busy man, brought before you the physical circumstances of the inhabitants of the city in which you live as a field for practical Christianity. I have said the only hope for Glasgow lies in the Church, which alone has the hand endowed with virtue to convey healing to those social sores. The same may be said of all our towns according to their special necessities. The constantly increasing proportion of the population of this country which is concentrating round our towns constitutes one of the most anxious features of the times. Be assured if the Church neglects this field, the devil and his ministers will not. Those one and two roomed houses are filled with restless, uncomfortable souls, wakening up to the contrast between their misery and the luxury of their neighbours, and ready to grasp at any theory or project however wild, which promises material relief. Nihilism, Communism, Socialism, Mr. George, Bradlaugh—any sort " of Morrison's Pill " will be eagerly swallowed. That is the future before us if the Church does not carry soothing and sanity to the physical discomforts of the people. I cannot find words in which to take leave of you and of my subject, better than those of Carlyle :—

" It is to you, ye Workers, who do already work, and are as grown men, noble and honourable in a sort, that the whole world calls for new work and nobleness. Subdue mutiny, discord, wide-spread despair, by manfulness, justice, mercy, and wisdom. Chaos is dark, deep as Hell ; let light be, and there is instead a green flowery World. Oh, it is great, and there is no other greatness. To make some nook of God's creation a little fruitfuller, better, more worthy of God ; to make some human hearts a little wiser, manfuller, happier—more blessed, less accursed ! It is work for a God. Sooty Hell of mutiny and savagery and despair can, by man's energy, be made a kind of Heaven ; cleared of its soot, of its mutiny, of its *need* to mutiny ; the everlasting arch of heaven's azure overspanning *it* too, and its cunning mechanisms and tall chimney-steeples ; God and all men looking on it well pleased."

ON THE "TICKETED HOUSES" OF GLASGOW, WITH AN INTERROGATION OF THE FACTS FOR GUIDANCE TOWARDS THE AMELIORATION OF THE LIVES OF THEIR OCCUPANTS.[1]

We open our new session under circumstances of peculiar sadness. It is only a few weeks since a distinguished member of this Society was removed from among us in the very heyday of his reputation. To-morrow some of us will follow to the grave the remains of a former occupant of this chair, equally distinguished in his own sphere. Both were friends of mine ; and I shall only, on the present occasion, endeavour to express what I find in my own mind as the impression left by their contact with me, leaving to other and more competent hands the summing-up of what they were to the Society and to the professions which they adorned.

I had abundant opportunity of forming some estimate of Mr. Sellars as an architect, through occasions arising from my official position. I assisted Mr. Carrick in adjudicating upon the competitive plans sent in for the Victoria Infirmary. As a director of the Sick Children's Hospital and Dispensary, and of Anderson's College Medical School, I made further acquaintance with his work. The outcome of these experiences was to convince me that Mr. Sellars had a singular grasp of the hygienic and administrative requirements of such institutions, and a wonderful facility in giving them satisfactory structural expression. The originality and boldness with which he encountered difficulties, such for example, as a refractory site in relation to the functions to be performed in his building, bore all the marks of true genius. He seemed never to be trammelled by precedent or to exhaust his fertility of resource. Along with this eminently practical faculty there was a graceful and fastidious taste, which softened all his effects with a refined detail of artistic decoration. I shall not refer to his crowning work—the International Exhibition—excepting to remark upon the singularity of the fortune which led Mr. Sellars to expend the ripeness of his imagination, and exhaust his energies, upon a structure of so much beauty and delight which was yet to serve only a passing purpose. Usually between the transitory life of the architect and the duration of his works there is contrast and not similarity; but here the work passes away with its author, and both alike will remain to us only as a memory or a picture.

---

[1] Presidential Address, read before the Philosophical Society of Glasgow, at the opening of 86th Session, 7th November, 1888.

With Dr. William Wallace my intimacy was naturally, owing to our relative positions in the public service, much greater and of longer duration than with Mr. Sellars. In 1876, and again in 1879, we were together as members of deputations of the Town Council, visiting sewage works all over England, and in 1880 we travelled alone on the same errand. We were thus for weeks together in continuous friendly and professional intercourse. I may say that the reports of these deputations are practically the work of Dr. Wallace, and there is no part of the enormous literature of the sewage question which has more intrinsic value or is better known. The reason is not far to seek. These reports are remarkable for dealing with a subject which is ravaged by faddists, quacks, and speculators, in a dispassionate, plainly-practical, and common-sense way. This seemed to me to be Dr. Wallace's forte. He applied his knowledge of chemical science to practical purposes, whether industrial, or sanitary, or commercial, with a breadth of view which showed how profound was his knowledge of applied chemistry, how intimate his acquaintance with industrial processes, and how, over all, there presided a sound and clear judgment. In questions of trade nuisances authorities could have no more trustworthy referee, and clients no more honest and skilful adviser. As a man Dr. Wallace was singularly unaffected in manner, equable in temper, and quietly genial and kindly in disposition. At the grave's mouth it is not qualities of intellect which come uppermost in our thoughts, but those of the heart, and I can say of our departed friend that all his relationships were sweetened by the gentleness of his heart.

But, gentlemen, although its members die, the Philosophical Society lives, and I now propose to tell you something about the "ticketed houses" of Glasgow, and to interrogate the facts for guidance towards the amelioration of the lives of their occupants.

The general relation between the size of the houses in which people live and the health they enjoy has been sufficiently established. Comparing the eight principal towns of Scotland on the basis of their death-rate in the ten years, 1871-80, I have elsewhere[1] shown that they fall "into two well-marked sets of four, viz.:—Aberdeen, Leith, Perth, and Edinburgh, with death-rates below 24, and houses of three to five rooms; and Dundee, Greenock, Paisley, and Glasgow, with death-rates above 25, and houses below three rooms. In this group the death-rate rises *pari passu* with the diminution in size of the average house." Further, following the average number of inmates per inhabited room, it was found that in general the mortality rose step by step with that number in these towns, and, still further, that if we began with Aberdeen, which has 13.6 per cent. of its inhabitants living in one room and the lowest death-rate, we rose gradually, without a break, to Glasgow, with 24.7 per cent. living in one room and the highest death-rate. Again, comparing the twenty-four districts into which Glasgow is divided for statistical purposes, there also the same general relation was demonstrated. "Blythswood" stood at the top, with the lowest death-rate and the largest and most thinly-peopled houses; while "Bridgegate and Wynds" stood at the bottom, with the highest death-rate and the smallest and most crowded houses. In all these investigations I could only be said to work round the question—using such data as were available—arriving at results which were sound and unimpeachable, but still indirect.

In 1877, in a paper "On the Comparative Prevalence of Filth Diseases in Town and Country," which I read to this Society, I said—"I believe that if you were to classify the whole population of the city according as they occupied houses of one, two, three, four, five, or more apartments, and then to ascertain the aggregate death-rate from all causes in each class . . . it would have its maximum in the population living in one-apartment houses, and fall in gradations to a minimum among those who inhabited the larger houses." In that paper I submitted the death-rates among the inhabitants thus classified from diphtheria, croup, enteric fever, and diarrhœa, calculated for three and a-half years. At that time no similar investigation had been made. The nearest was a classification of the inhabitants of Barmen according to income, which brought out a mortality of 34½ per 1000 among persons having an income of less than £30; of 19 among persons whose income was from £30 to £75; of 18 among persons whose income was from £75 to £150; and of 16½ above £150. Recently the Medical Officer of Dundee has constructed a table of the mortality statistics of that town for 1884, which shows that the death-rate of the inhabitants of houses of one and two rooms was 23.3; of three-room houses, 17.2; of four-room houses and upwards, 12.3—while the general death-rate of Dundee was 20.7. This year, in Edinburgh, an investigation of the death-rate on the basis of rental has been commenced. The results for the first half of the year are as follow:—Under £5, death-rate per 1000 inhabitants, 23; £5 and under £10, 21.34; £10 and under £15, 20.1; £15 and under £20, 15.86; £20 and under £30, 14.1; £30 and under £40, 18.8; £40 and under £50, 13.16; £50 and upwards, 14.76—the general death-rate for the same period being 19. It is premature to draw inferences from these data; but the basis of rental is not so good as that of size of house. Whatever hygienic meaning more extended statistics on this basis may possess must depend upon the relation of rental to the air-space or house-room which it represents, and, therefore, it would be better at once to take the house-room as the basis. The question is—How much does the rental buy?

---

[1] See paper on "House in Relation to Public Health," which precedes this. —[Ed.]

Before submitting the results of an investigation of the mortality statistics of the inhabitants of Glasgow for 1885, according to the size of the houses which they occupied, let me say a word on the difficulties of such investigations. It is necessary that the residence of every deceased person shall be sought out and its size noted. If every address led the inquirer to a front door this would be an easy task; but when he finds himself at a close whose number serves for a front land and several back lands, with no end of turnpikes, stairs, flats, and lobbies, the task is anything but easy. The address then becomes something like this: Bridgegate, No. 29, back land, stair 1st left, 3 up, right lobby, door facing! But the description of Nineveh is true of Glasgow:—"That great city wherein are more than six score thousand persons that cannot discern between their right hand and their left hand." Mistakes in the addresses given are very frequent. You may find yourself at the door of a shop, or there may be no such number in the street, or no such person discoverable at the number given. In short, from a variety of causes, between 2 and 3 per cent. of the deaths registered cannot be traced, and their allocation therefore remains "unknown." Then there are the deaths in Institutions. These are traced as far as possible, but a large number, amounting to between 3 and 4 per cent. of the deaths in the city, cannot be so allocated: and if they represent Glasgow people they simply remain against the Institution. It is obvious that all those deaths of persons whose residence cannot be traced, whether they take place at their own houses or in Institutions, belong to the class of dwellers in small houses, and that we cannot simply set them aside if we wish to get a fair statement of the facts. This is the great difficulty of the inquiry. Our poorhouses in particular are filled with persons from our one and two-room houses. They die there of pulmonary and other diseases, which reflect back whatever hygienic meaning they possess upon the locality where they lived. Yet they frequently cannot be referred to any special house. I shall subsequently explain how I propose to get over this difficulty. Having distributed the deaths, the next question is—What is the population of the various grades of house? This I have got by assuming that the proportion was the same in 1885 as in 1881, which I believe to be sufficiently correct in dealing with the city as a whole.

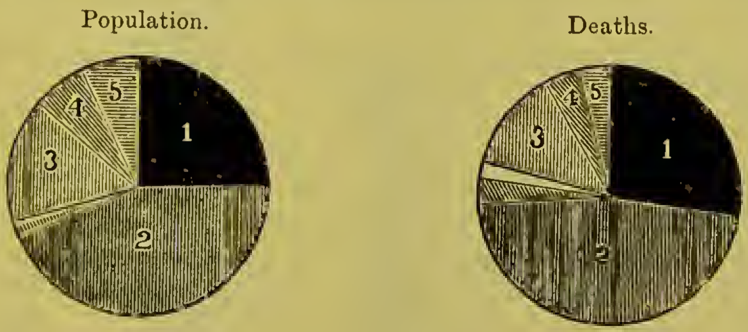
The results of this inquiry, when tabulated, assume very insignificant dimensions considering the time and trouble they represent, but statistical tables of any sort cannot profitably be submitted in speech, and I shall endeavour to put you in possession of their outcome as plainly and briefly as possible. The population of Glasgow in 1885 was 543,295, the number of deaths was 13,439. The distribution of population and the deaths in the inhabited houses according to their size is as follows:—

	Population.	Deaths.
1 Room, - - - - -	134,728	3,636
2 Rooms, - - - -	243,691	6,325
3 do., - - - -	86,956	1,747
4 do., - - - -	32,742	581
5 do. and upwards, - -	38,647	434
Institutions, - - - -	6,531	427
Untraced, - - - -	—	289
Whole City, - -	543,295	13.439

Let us first consider the proportion of the total population who lived, as contrasted with the proportion of the total deaths which took place, in each size of house. The result is shown in the following table :—

	Population.	Deaths.	
1 Room, - -	24·7 per cent.	27 per cent.,	or 2·3 per cent. *above* due proportion.
2 Rooms, - -	44·7 ,,	47 ,,	2·3 ,, ,,
3 do., - -	16 ,,	13 ,,	3 per cent. *below* due proportion.
4 do., - -	6·1 ,,	4·3 ,,	1·8 ,, ,,
5 do. and upwards,	7·1 ,,	3·3 ,,	3·8 ,, ,,
Institutions, -	1·4 ,,	3·2 ,,	
Untraced, - -	—	2·2 ,,	

I have constructed a diagram which will convey to your eyes the general meaning of this mass of figures, which is the excessive incidence of the mortality of the city upon the inhabitants of houses of one and two rooms. The inmates of our institutions are placed along with the inhabitants of one and two-room houses in the Population diagram, and the institutional and untraced deaths alongside the deaths contributed by one and two-room houses in the Mortality diagram. The result is that those houses contained 70.8 per cent. of the population, and contributed 79.4 per cent. of the deaths, or 8.6 per cent. more than their due proportion; while the remaining 29.2 per cent. of the population, living in houses of three rooms and upwards, contributed only 20.6 per cent. of the deaths, or 8.6 per cent. less than their due proportion.


Population.

Deaths.

Let us next compare the death-rates in these various classes of the population. Leaving out of consideration the deaths which could not be allocated, I find—giving the calculations in round numbers per 1000 of the population—that, while the general death-rate of the city in 1885 was 25, the death-rate in one-room houses was 27; in two-room houses 26; in three-room houses 20; in four-room houses 18; in houses of five rooms and upwards only 11. But this leaves 716 unallocated deaths unaccounted for. I have therefore divided the population into three classes, namely—(1) Those living in one and two rooms, with which I include the inmates of Institutions and those unallocated deaths; (2) those living in houses of three and four rooms; and (3) those living in houses of five rooms and upwards. The death-rate in the first class is then found to be 27.74 per 1000, in the second 19.45, and in the third only 11.23.

We now turn to the question—What is the comparative incidence of certain classes of disease upon these classes of the population? I take zymotic or infectious diseases; diseases of the lungs, including consumption; diseases special to children under five years of age, such as convulsions and other affections of the brain and nervous system, atrophy or wasting, and premature birth, which are all essentially connected with disordered or defective nutrition; and I have also selected deaths in children from accident and syphilitic disease, a small class, but one pregnant with meaning.[1] The results are exhibited in another diagram, the height of the columns in which, being on the same scale, will convey to your eyes both the comparative aggregate death-rate in the three grades of houses, and the comparative prevalence among their inhabitants of these classes of disease. The rates are per 100,000 inhabitants, thus con-

---

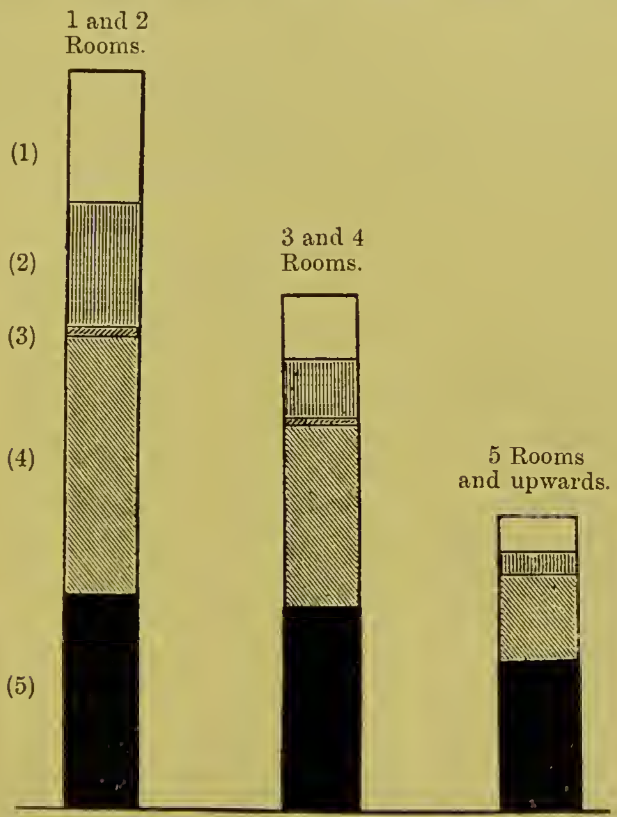
[1] The following Table gives the actual numbers from which the death-rates are calculated:—

Size of House.	Zymotic.	Lungs.	Children.	Accidents, &c.	Others.	Total.
1 Room, - - -	666	1,324	657	63	926	3,636
2 Rooms, - - -	1,118	2,244	1,138	51	1,774	6,325
3 do., - - -	228	637	222	10	650	1,747
4 do., - - -	67	188	59	3	264	581
5 do. and upwards,	44	127	35	—	228	434
Institutions, - -	32	132	24	5	234	427
Untraced, - - -	24	90	30	2	143	289
Whole City, -	2,179	4,742	2,165	134	4,219	13,439

verting the decimals in rates per 1000 into whole numbers :—

	1 and 2 Rooms.	3 and 4 Rooms.	5 Rooms and upwards.
Zymotic Diseases (including Diarrhœa),	478	246	114
Acute Diseases of the Lungs (including Consumption), - -	985	689	328
Nervous Diseases and Diseases of Nutrition of Children, - -	480	235	91
Accidents and Syphilis in Children,	32	11	—
Miscellaneous Unclassified Diseases, -	799	764	590
All Causes, - - -	2,774	1,945	1,123

The general result may be summed up with sufficient accuracy in these numerical expressions. Taking the death-rates in the largest houses as unity, the death-rate from



(1) Zymotic Diseases. (2) Nervous and other Diseases special to Children. (3) Accidents and Syphilis in Children. (4) Diseases of the Lungs. (5) Miscellaneous.

zymotic diseases was 2 in medium-sized houses and 4 in the smallest houses; the death-rate from *diseases of the lungs* was 2 in medium-sized houses and 3 in the smallest houses; and from *diseases of nutrition special to children* it was 2½ in medium-sized houses and fully 5 in the smallest houses. There were no deaths from *accident or specific disease* in the large houses; but, taking the death-rate in the medium-sized houses as unity, the death-rate from these causes in the smallest houses was 3. A flood of light is thrown upon these facts by a paper which appeared in the *Transactions* of the Royal Society of London for 1887, on "The Carbonic Acid, Organic Matter, and Micro-Organisms in Air, more especially of Dwellings and Schools," by Professor Carnelley and Drs. Haldane and Anderson. We might safely interpret our figures on general principles as well as from the observations made by the senses of those who are familiar with the comparative cubic space and the prevalent atmospheric conditions of a large proportion of our small houses, that the prevalence of zymotic and pulmonary diseases was causally connected therewith; but precise scientific observation and ascertainment of physical facts are always welcome, and these we have in this paper. "Taking the average quantity (in excess of outside air) of carbonic acid, organic matter, and micro-organisms, respectively, in houses of four or more rooms as unity, then in one and two-roomed houses" the following table shows the results of chemical analysis and the application of Hesse's method of determining the number and nature of the micro-organisms present in the air, in the case of selected houses in Dundee:—

	Houses of 4 Rooms and upwards.	2-Roomed Houses.	1-Roomed Houses.
Cubic space per person, -	1	0·13	0·11
Carbonic acid, - - -	1	1·5	2·0
Organic matter, - - -	1	1·6	4·4
Micro-organisms, total, -	1	5·1	6·7
Bacteria, - - -	1	5·1	6·9
Moulds, - - -	1	5·5	3·0

Dr. Anderson contributes an elaborate "Comparison of the Mortality Statistics with the Composition of the Air of Dwelling-houses," perhaps more elaborate in respect of the classification of disease in minute detail than the smallness of the figures when so subdivided warrants, but his main conclusions agree in general with mine. He finds "that the rapid increase in the death-rate as we pass from four to one-roomed houses is by far most marked in children under 5"; and that acute diseases of the lungs, and zymotic diseases in general, are also in excess.

Although I have classed consumption with other affections of the lungs, because of dubiety about the diagnosis in the case of people who receive so little medical attention as our Glasgow poor, as shown by the number of uncertified deaths, it is interesting to note that the death-rate from consumption is highest among the inmates of three-room houses in Glasgow, as it is in Dundee. Dr. Anderson's suggested explanation is probably correct, that the high infant mortality from other forms of tubercular disease returned as nervous diseases, atrophy, wasting, &c., prevents the growth of young adults in the smaller houses, these being most prone to the incidence of tubercle on the lungs.

Let me recall to you the fact that the mean death-rate was 27.74, 19.45, and 11.23 in the inhabitants of the three grades of houses. Now it is quite clear that if the whole city is divided into twenty-four districts, in which these three classes of inhabitants are mingled in different proportions, and we find that these districts produce death-rates ranging from 16 to 42, there must be vast differences in the range of mortality even in the same grade of houses. If houses of one and two apartments, of three and four apartments, and of five apartments and upwards were homogeneous in their vital results we might account for death-rates below 28 but not for those above. It must be apparent, from the fact that 70 per cent. of the population live in the one and two-room houses, and only 7 per cent. in the largest houses, that the secret of the health of Glasgow lies within the one and two-room houses. That there are enormous differences in the vital results of the one and two-room houses must be admitted when we find districts which have practically the same proportion of these houses returning death-rates separated by such a wide interval as 23 and 42. These were the death-rates in 1885 of the district of "St. Rollox," so called because it touches the works of that name on their southern border, and of "Bridgegate and Wynds." In the former 83 per cent., in the latter 84 per cent. of the houses are one and two-roomed. The former had a mortality of 23, the latter of 42. What circumstances have fixed this great gulf between the inhabitants of the small houses of St. Rollox and of Bridgegate and Wynds? Is it a difference in the houses, or a difference in the people, or both?

I find in a "Report on the Operations of the Sanitary Department of Glasgow, for the year ending 31st December, 1887," data collected with great intelligence and labour by Mr. Fyfe, Sanitary Inspector, among which, supplemented from MS. records of the department, there is material which will help us to a solution of this problem. It is better to retire to one's study with this unpretentious pamphlet than with Karl Marx or Henry George. I may remind you that the Glasgow Police Act confers a discretionary power to regulate the occupation of houses of not more than three rooms, and not exceeding an aggregate capacity of 2000 cubic feet, exclusive of lobbies and recesses. This is done by affixing tinplate tickets on the outer door, stating the cubic contents, and the proportionate inmates allowed, at the very low rate of 300 cubic feet per adult or two children under eight years. These are called "ticketed houses" and are all one or two-apartment houses. A system of night-inspection over such houses is constantly maintained, and results in prosecution for overcrowding when the legal number is exceeded. It was under the guidance of Typhus Fever that this system was originally applied, and its extension still follows the discoveries of the epidemic inspector. But, as you may suppose, the better class of tenants avoid such houses and even their neighbourhood. Consequently, landlords are always warned before tickets are put up in fresh localities, so that they may save the reputation of their property by getting rid of the overcrowding tenant. You will readily recognise that the inhabitants of ticketed houses form a distinct class within the general body of inhabitants of one and two-room houses. Nor are they an inconsiderable class. The total number of ticketed houses in the city is 23,288—namely, 16,413 houses of one room, and 6875 of two rooms. About 11 per cent. in each case were found empty, so that we have 14,642 inhabited houses of one room, containing 46,463 inmates, and 6157 inhabited houses of two rooms, containing 28,704 inmates. It thus appears that 35 per cent. of the whole population of our one room and 14 per cent. of the whole population of our two-room houses have their houses ticketed. Let us endeavour to understand how these people are differentiated from their neighbours. In doing so I shall make reference to those admirable model buildings recently erected by the Corporation in the Saltmarket, using them to furnish us with datum points in this social survey. They could not be ticketed, being far above the limit fixed by the Police Act, but I have had a census of the inmates taken, and have obtained measurements under the same restrictions as are applied to ticketed houses.

I. Observe first that almost without exception those ticketed houses are what we call "made-down houses." No plans of these houses were ever submitted to the Dean of Guild Court. They may be either, as in the older parts of the city, in tenements erected long before the Police Act of 1866 for the gentry of old Glasgow, or in tenements which have passed the Court recently as houses of three, five, eight, or ten rooms. In short, these houses have all been parts of houses of larger size; often parts of single rooms of houses of larger size, divided by partitions, sometimes of mere wood, run across the floor of those large rooms. This means defective ventilation, defective light, dark lobbies, crowded stairs, and disproportion in the conveniences provided. The proprietor may of his own motion have done something to add to those conveniences. The Sanitary Department may have compelled him to do more. Something may have been done to improve the light and ventilation when disease has brought the inspector upon the scene. But, after all, there remains the fact that tenements of small houses which demand the greatest architectural care and skill to make them physically wholesome, are evolved from structures designed for occupation under totally different conditions. I need scarcely point to the Saltmarket houses as illustrations of the application of foresight and thought to adapt structure to mode of occupation. These aim at the highest standard. The small houses which are not ticketed were either designed as such, or belong to the best class of made-down houses, where a necessary process has been intelligently and conscientiously carried out before occupation, and this is all that is wanted.

II. So much for defective surroundings and accessories: let us now go inside the ticketed house. We find that the average air-space of a one-room house is 1058 cubic feet; the average number of inmates is 3.17, so that the average air-space per inmate is 334 cubic feet. I make no distinction between adults and children, because it is one which is not physiologically justifiable, and besides it would involve more complicated calculations. The average air-space of a one-room house in the Model Buildings is 2213 cubic feet, the average number of inmates 2.92, and the average air-space per inmate 758 cubic feet. This is also a high standard. The ordinary non-ticketed one-room house ranges in capacity between 1200 and 1350 cubic feet, and is never crowded down to the legal minimum per inmate. Turning to the ticketed two-room house, we find that the average total air-space is 1725 cubic feet, the average number of inmates 4.66, and the average air-space per inmate 370 cubic feet. In the Model Buildings the average air-space of a two-room house is 3158 cubic feet, the average number of inmates 4.29, and the average air-space per inmate 736 cubic feet. The non-ticketed two-room house is simply a duplication or a little more than a duplication of a one-room house, and is always occupied so as keep far above the legal minimum.

COMPARATIVE RENT AND AIR SPACE
IN
TICKETED HOUSES AND MODEL BUILDINGS.

	Total Cubic Space.	Average No. of Inmates.	Cubic Space per Inmate.	RENT.		
				Per Month.	Per Inmate.	Per 1000 Cub. Ft.
One Room.						
					D.	D.
MODEL, - - - -	2,213	2·92	758	13/4	54·8	72
TICKETED,						
Whole City, - - -	1,058	3·17	334	7/11	29·96	90
"Bridgegate," - -	1,130	3·12	362	6/11	26·6	73
"Cowcaddens," -	930	2·82	330	8/	34·0	103
"Calton," - -	976	2·85	343	6/1	25·6	75
"Brownfield," - -	1,044	3·04	343	9/9	38·5	112
Two Rooms.						
MODEL, - - - -	3,158	4·29	736	16/4	45·7	62
TICKETED,						
Whole City, - - -	1,725	4·66	370	10/3	26·39	71
"Bridgegate," - -	1,777	4·77	373	9/6	23·9	64
"Cowcaddens," -	1,752	4·83	363	10/3	25·5	70
"Monteith Row," -	1,659	3·61	460	7/9	25·8	56
"Anderston," - -	1,615	4·67	346	12/6	32·1	93

The ticketed house, then, is small of its kind to begin with, and owes its ticket to the constant disposition to overcrowding of its inmates. In fact, 13 to 14 per cent. of the one-room houses are found overcrowded when inspected during the night, and 6 to 7 per cent. of the two-room houses. Of the inmates of the ticketed one-room houses, 5 per cent. are lodgers; of the inmates of the two-room houses, 6 per cent.

III. What do these people pay for this accommodation? These houses are taken by the month or by the week. I therefore give monthly rents. These vary slightly in different districts. A ticketed one-room house reaches the lowest average rent in the "Calton," namely, 6s. 1d.; and the highest average, in the small district of "Brownfield," is 9s. 9d. A ticketed two-room house reaches the lowest average in a bad part of the district we call "Monteith Row," namely, 7s. 9d.; and the highest, which is in "Anderston," is 12s. 6d. But if I were to go into the details of the districts I should weary and puzzle you. Let us discuss the average for the whole city. The rent of a one-room house is 7s. 11d. This is 29.96 pence per inmate, and at the rate of 90 pence per 1000 cubic feet of air-space. The rent of a two-room house is 10s. 3d. This is 26.39 per inmate, and at the rate of 71 pence per 1000 cubic feet of air-space. If, therefore, we look to the inmates accommodated, the inmate of a two-room house pays 3.57 pence less for 36 cubic feet more air-space than the inmate of a one-room house. If, again, we regard the rent as coming from one pocket, the tenant of a two-room house pays fully 29 per cent. more rent for 63 per cent. more air-space than the tenant of a one-room house. He pays 71 pence per 1000 cubic feet, while the one-room tenant pays 90 pence. We shall be better able to discern the full meaning of these points if we turn to the Model Buildings and consider the whole facts together. There the rent of a one-room house is 13s. 4d. This is 54.8 pence per inmate, and at the rate of 72 pence per 1000 cubic feet of air-space. The rent of a two-room house is 16s. 4d. This is 45.7 pence per inmate, and 62 pence per 1000 cubic feet of air-space. There the inmate of a two-room house pays 9.1 pence less for 22 cubic feet less air-space than the inmate of a one-room house; but the tenant of a two-room house pays 22½ per cent. more rent for 42 per cent. more air-space. He pays 62 pence per 1000 cubic feet, while the one-room tenant pays 72 pence.

Observe, in the first place, that both in the ticketed houses and the Model Buildings the tenant of a two-apartment house gets better value for his money than the tenant of a one-apartment house. In the ticketed house he gets 1000 cubic feet of air-space for 19 pence less; in the Model house for 10 pence less. It is evident that in the Model Buildings the design has been to be generous to the tenant of the one-room house both in air-space and rent. Still, both cases illustrate the economic law that the greater the number of transactions necessary to dispose of the same quantity or amount of a commodity, the greater the margin which must be allowed to cover risk and outlays. The more a customer takes, he may expect to get the commodity at a diminishing rate per unit of that commodity. The larger the house, the less it will cost per unit of space, so that the man who lives in one room pays much more for his space than the occupant of the self-contained house. Poverty, instead of receiving discount, has to pay interest. But what shall we say about the other fact, that the tenant of the Model house pays less per 1000 cubic feet of air-space than the tenant of the ticketed house? Well, he takes more of it, he takes it for a year and he pays quarterly, and this ought to give him some advantage. A man who buys a quarter of an ounce of tea and pays it by instalments cannot expect to have it at the same rate per ounce as the man who buys a pound. But what if, after all, his quarter-ounce of tea is chiefly sloe-leaves? This is precisely the position of the man who rents a ticketed house. He pays 18 pence more per 1000 cubic feet in his one-room house and 9 pence more per 1000 cubic feet in his two-room house than he would in the Model Buildings, and yet, compared with the article he would get in those buildings, that which he accepts is but as sloe-leaves to the finest product of China. Just cross the street from those buildings and you find yourself in the district of "Bridgegate and Wynds," where the rent of a ticketed one-room house averages only 6s. 11¼d., and of a two-room house only 9s. 5¾d. —the most wretched houses in the city, although in cubic space they are above the average of the ticketed class, because they are so often fragments of the houses of the old gentry. Even there the tenant pays 74 pence per 1000 cubic feet of his one room, and 64 pence per 1000 cubic feet of his two rooms, which is in each case 2 pence above the Model Buildings' rate. If we include the sculleries in the Model Buildings, the rent per 1000 cubic feet is reduced to 64 pence and 54 pence, respectively, which is in each case 10 pence below the rent across the street, where there are no enclosed sculleries, or water-closets, or, indeed, any of the elements of health or comfort.

There is something more than poverty in the problem of the high rent paid by the tenant of the ticketed house—high absolutely, and still higher relatively to the quality of the article obtained. He not only pays interest on his poverty, but on his character. Those 75,000 people comprise not only the criminal class, but the whole social *débris* of this large city; some who are bravely struggling with poverty, and far more who are alike bankrupt in character and in fortune. They are the nomads of our population. If we could see them in their constant movements from place to place the sight would resemble nothing so much as that which meets our eye when we lift a stone from an ant's nest. The City Assessor will tell you that they change their location in hundreds every month. They

> "Fold their tents, like the Arabs,
> And as silently steal away,"

leaving, too often, their public and private obligations behind them. Yet their flittings cause no stir in the street. You may see the woman with her gown turned up over her shoulders, so as to enclose a few pots and pans and articles of crockery, while the man carries one of those skeleton-like grates on his back, and the children a chair or a stool, or a meat-can with a string fastened across the mouth to serve as a handle to this improvised pitcher. The more luxuriously furnished can transport their whole property in detachments, with the help of a neighbour or two, in an evening. Poor things, their condition illustrates the old proverb, that "beggars cannot be choosers." If you look in upon them and remark on the discomforts of their house, your sympathy makes them eloquent at once. They are sure to say, "It is not fit for a dog to live in"; but, when you ask them why they stay there, they are silent. You ask what is their rent, and they tell you. You say, "Dear me! you will get a nice little house for the same money at such a place." Their immediate reply is, "Ah, sir! they won't take the likes of us there," which means that there they must pay their rent regularly, be cleanly, have no riotous outbreaks on Saturday nights, and, in short, reform their habits and their lives. So they are thirled to their ticketed house, and become the bond-slaves of their landlords—afraid to complain—paying dearly for a bad article. What can be done for these people? Does the erection of the Model Buildings bring any advantage to them? I must answer, No! You will not receive them there; and why? You have provided wholesome houses, and you feel you have a right to select your tenants; that commercially you can do so. If every landlord had provided himself with a sound article—sound in a much more moderate sense than the Model Buildings—he would, both morally and commercially be in a position to select his tenants, even the humblest of them, and so put a universal premium on good living. But just cross the Saltmarket again, and ask yourself how the owner of such property could select his tenants? Even if morally a man could convince himself that he had a right to pick and choose, commercially it is impossible; and for commercial reasons it is not done, and cannot be done.

You might as well try to sell butterine as fresh butter in the West-End, or offer sloe-leaves for tea or sand for sugar, and insist that your customers shall be well-dressed and intelligent, pay ready money, and always say grace before eating your rubbish. After you have done your best to provide a fairly-honest house, you *may* select your tenants; and when you have an honest intention to keep your property in repair and keep down nuisances, you *may* appoint a caretaker to see to the conduct of your tenants, but not before. The housing of bad tenants involves morally the inner consciousness that you deserve no better, and, commercially, the knowledge that you dare not look for better.

Looking at this problem of house-accommodation calmly in the light of reason, common-sense, and morality—What is the duty of public authorities and of the community in a private capacity?

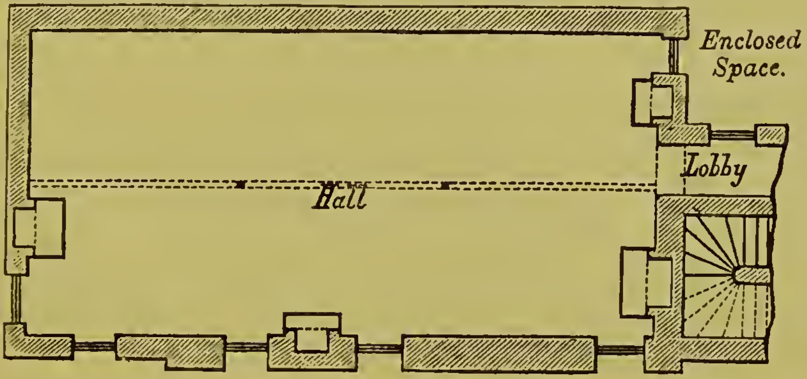
The duty of authorities is to get the power, if they have it not, and to exercise it if they have, to improve the dwellings which exist by reforming and weeding out the bad, and seeing that the small houses which are being provided are up to a reasonable standard of wholesomeness. This is a wide general statement, and I wish to give it practical point by specifying shortly some powers which the authorities here do not possess,[1] but which I trust will seem so reasonable that they will commend themselves to your approbation.

There is this process of "making down" houses. We have seen that one and two-room houses are not bad *per se*, but only when bad houses and indifferent people are brought on inevitable commercial principles together. It is reasonable that a man should be compelled to submit plans of new buildings to a responsible court, and yet not be compelled to submit plans when he proposes to alter the mode of occupancy and therefore the whole previous careful arrangement and adaptation of structure and convenience, light, and ventilation to the number of families and inhabitants? Why wait until the thing is done and disease appears, and then, by a tedious process, with an array of experts, compel, or endeavour to compel, alterations which can only prevent future mischief, but cannot restore broken health or revive lost lives? The process of "making down" houses is a lucrative one to the original owner. I may mention two of the most recent illustrations which have come under my notice. In one case a tenement containing six houses of six apartments, which stood one year at a rental of £175 on the valuation roll, was subdivided into 12 houses of three apartments, and was returned next year at a rental of

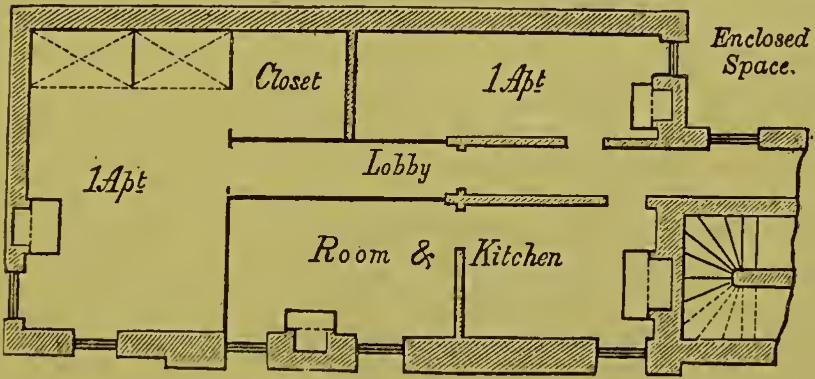
---

[1] Most of the suggestions which follow took practical form in subsequent legislation.—[Ed.]

£222. In another case a tenement containing six houses of four apartments, which stood one year at a rental of £78, was sub-divided into 21 houses of one room, and was returned next year at a rental of £134. Neither case is an example of the worst forms of "making down," but there was no expenditure incidental to the change at all equivalent to the profit of the transaction, still less adequate to the requirements of health. It is the owner who makes this change who ought to bear the cost of alterations. When the property is sold it is sold at the increased rental. Not uncommonly the first effect of the intervention of the Sanitary Department is to lead to such a sale; and then, of course, any expenditure becomes a loss to the new owner. I do not object to "making down" houses. The "made-down" house is as necessary as a second-hand clothes market. I say it must be regulated, and until it is regulated all our efforts to raise the standard of the small dwellings of Glasgow will only resemble the labour of Sisyphus.



Property as it was.



Property as it is.

I show two plans which illustrate well the liberty which may be taken by proprietors in the way of manufacturing small houses by this process, so long as they do not interfere with the external walls, and thus bring their operations under the review of the Dean of Guild Court. This alteration was effected a year ago, and was only discovered when an epidemic inspector came upon some suspicious cases of disease which I was asked to see. One plan shows a hall or workshop which had ceased to bring in a satisfactory rent to the owner. He accordingly sub-divided it as shown in the other plan, producing two houses of one apartment and one of two apartments. The thick hatched lines show the portions of the necessary partitions which were built of brick, the remainder, in thin lines, being merely wood. It will be observed that the back main wall is a "dead wall," that is to say, it contains no windows or other apertures. There can be no ventilation of the large single apartment, so that the end occupied by the beds and the room called a "closet" are filled with stagnant air, which there is no possibility of renewing. The single room against the dead wall has only a small window opening into a "well" or space enclosed by other buildings. So long as small houses can be produced in this irresponsible fashion, insanitary dwellings will spring up in one place as fast as they are abolished in another. This glaring case was discovered by the incidence of disease, and can only be remedied by a process under the Public Health Act, expensive to all parties, and possibly ending in a poor compromise.

We also want in Glasgow the following summary method of dealing with unwholesome houses, the steady application of which during the last nine years goes far to account for the almost unexampled improvement which has taken place in the health of Edinburgh. I quote from the Edinburgh Police Act (1879), section 206 :

"206. If the Medical Officer of Health and the Burgh Engineer shall certify in writing to the Magistrates and Council that any house or building, or part of a house or building, is unfit for human habitation, the Magistrates and Council may, by their order, affixed conspicuously upon such house or building, declare that the same is not fit for human habitation, and it shall not, after a date in such order to be specified, be inhabited; and every person who shall, after the date or time mentioned in such order, let or occupy, or continue to let or occupy, or suffer to be occupied, such house or building, or part of such house or building, shall be liable to a penalty not exceeding five pounds, and a further penalty not exceeding forty shillings for every day during which such occupation is continued, provided always that before pronouncing any such order the Magistrates and Council shall call upon the owner to show cause against the said certificate within such reasonable time as they consider proper, and shall give such owner an opportunity of being heard before them, and, if he appear, shall hear him and such evidence as he may adduce ; provided also, that if at any time after such order has been made, the Magistrates and Council shall be satisfied that such house or building, or part of such house or building, has been rendered fit for human habitation, they may revoke the said order, and the same shall thenceforward cease to operate. The Magistrates and Council shall also, at such times as they shall fix, hold open courts for the consideration and disposal of appeals against such certificates, and it shall not be necessary that a majority of the Magistrates and Council be present to constitute such courts; provided, further, that the preses of such court shall have a deliberative as well as a casting vote."

You will observe that this constitutes the representatives of the people of Edinburgh, advised by their officials, the final judges when a house is "unfit for human habitation," and they are clothed with the most effective means of compelling the owner to make it fit for habitation—namely, the power to make it cease to be a rent-producing subject until the requisite improvements are effected, if improvement is possible. By a general clause in the Act the Town Council may devolve their functions on committees. This function is therefore vested in the Health Committee, sitting as a court, presided over by its chairman. This is an illustration of a principle which is applied throughout the States of America: that the Board of Health, elected by the people, shall be clothed with summary power to protect the health of the people. It would certainly open the eyes of some folks to read the "Manual for the use of Boards of Health of Massachusetts, containing the statutes relating to the public health, and the decisions of the Supreme Courts of Massachusetts relating to the same." One of these decisions, for example, is to this effect:—"The adjudication of the Board that a nuisance exists is conclusive, and no appeal lies therefrom." All the City Boards of Health in this State have the same summary powers as the Edinburgh Health Committee over house property, but embracing any and every condition or circumstance which is "a cause of nuisance or sickness to the occupants or the public." Still more worthy of the study of the people of this country is the "Tenement House Act,"[1] passed last year by the "People of the State of New York, represented in Senate and Assembly." I shall quote only one clause, in the hope that it may attract attention to the unexhausted resources of legislation for the amelioration of the social difficulties of the day, if only the people would wake up to the

---

[1] A tenement house is thus defined in this Act:—

"Every house, building, or portion thereof which is rented, leased, let or hired out to be occupied or is occupied as the home or residence of three families or more, living independently of each other, and doing their cooking upon the premises, or by more than two families upon any floor, so living and cooking, but fact that health has proprietary rights as well as heritable property :

"§ 659. Whenever it shall be certified to the Board of Health of the Health Department of the City of New York, by the Sanitary Superintendent, that any building or part thereof in the City of New York is infected with contagious disease, or, by reason of want of repair, has become dangerous to life, or is unfit for human habitation because of defects in drainage, plumbing, ventilation, or the construction of the same, or because of the existence of a nuisance on the premises, and is likely to cause sickness among its occupants, the said Board of Health may issue an order requiring all persons therein to vacate such buildings, or part thereof, for the reasons to be stated as aforesaid. Said Board shall cause said order to be affixed conspicuously in the building, or part thereof, and to be personally served on the owner, lessee, agent, occupant, or any person having the charge or care thereof; if the owner, lessee, or agent cannot be found in the City of New York, or do not reside therein, or evade or resist service, then said order may be served by depositing a copy thereof in the post office in the City of New York, properly enclosed and addressed to such owner, lessee, or agent, at his last-known place of business, or residence, and prepaying the postage thereon ; such building, or part thereof, shall, within ten days after said order shall have been posted, and mailed as aforesaid, *or within such shorter time, not less than twenty-four hours,* as in said order may be specified, be vacated ; but said board, whenever it shall become satisfied that the danger from said building or part thereof has ceased to exist, or that said building has been repaired so as to be habitable, may revoke said order."

I cannot better illustrate the difference between this sort of legislation and ours than by quoting an instance in which a single-apartment house had an open drain beneath the floor. The mother complained to us because the rats, walking in and out of this hole, alarmed her lest they should bite the children. Weeks were spent in serving notices, inspecting, certifying, and again notifying, before the proprietor removed this abominable nuisance.

---

having a common right in the halls, stairways, yards, water-closets, or privies, or some of them."

Various specific provisions with reference to houses so occupied are worth noting, for example :—

Water-closets, privy-sinks, or other similar receptacles, to be provided at the rate of not less than one for every two families.

Each occupant of a tenement-house must have not less than 600 cubic feet of air-space.

Whenever more than eight families live in any tenement-house, in which the owner thereof does not reside, there shall be a janitor, housekeeper, or some other responsible person, who shall reside in the same house, and have charge of the same, if the Board of Health shall so require.

After everything has been done by Parliament and by Local Authorities which can be done to exterminate unwholesome houses, and banish adulterated property from the market as resolutely and successfully as adulterated food, there will still be a necessity for the assistance of private effort. The public of Glasgow trust too much to authorities and officials for the solution of their social difficulties—more, I think, than any other community. Where are the "Open-spaces and Playgrounds Associations," the "Artizans' Dwellings Companies," and the like, which unite the business capacity and Christian sympathy of the citizens of so many other cities in successful labour for the common good? Why have we not an Octavia Hill in Glasgow? There are various ways in which private associations might help to elevate the 75,000 inhabitants of the ticketed houses of this city. They might attack the question of building new tenements of small houses, to be let at monthly rents, to return a modest interest on the outlay, and yet be within the means of those who could be tempted to try to lead orderly lives if they had the chance of physical circumstances which would help them up and not help them down, or keep them down. They might buy a tenement here and there which could be "made-down" in an honest fashion, and yet yield a reasonable return on the money invested. They might acquire a poor tenement, and try to acquire the poor tenants also, and make them feel the elevating influence of the introduction into the relation of landlord and tenant of friendly interest and moral responsibility. Or they might undertake the factorage of such properties held by private individuals, administering them on the principle that the maintenance of the property shall be the first charge on the rental. These last are undoubtedly the best directions which private enterprise can take. They are the methods of Miss Octavia Hill and those who work under her. They are far better than building model houses, selecting the good and casting the bad away, even if the good belong to the class for whom they were intended, which they seldom do. It is the people you reject who require your help. If you go on selecting you merely leave somewhere in the city a more utterly hopeless and homogeneously bad residuum. Read Miss Hill's book on "Houses of the London Poor," in which she relates her practical experiences. You will find that she is no soft sentimentalist, spoiling the poor by shutting her eyes to their frailties, and subverting the order of the universe by making intemperance and vice comfortable. She first convinces them that she will do her duty by them as their landlady, and then exercises the moral right which she has thus acquired, and which they do not fail to recognise, to make them pay their rents regularly, and otherwise do their duty by her. If the relationship between landlord and tenant is of this nature, no more powerful influence exists than that which the landlord possesses over the poor, unless it be that which exists where the relationship is commercial and not moral. The difference is that the former makes for the good, the latter for the evil. In the one case the eyes of both meet on rent day, with a consciousness of mutually-unfulfilled duty. The one winks at the derelictions of the other. In the other case the landlord's eye is friendly but firm with a sense of rectitude, and there is no flaw in his relations to which the tenant may appeal for excuse or defence.

UNINHABITABLE HOUSES:

Who Inhabit Them? Who Own Them? What Is To Be Done With Them?[1]

The Medical Officer of Health is familiar with the consideration of the question of habitability which is raised by the existence of certain conditions technically called "nuisances" in connection with dwelling-houses. The first great category of nuisances under the Scotch Public Health Act is thus described—"Any insufficiency of size, defect of structure, defect of ventilation, want of repair or proper drainage, or suitable water-closet or privy accommodation, or cesspool, and any other matter or circumstance rendering any inhabited house, building, premises, or part thereof, injurious to the health of the inmates, or unfit for human habitation or use." Before steps can be taken to compel an "owner" to remove any condition falling within this definition, the medical officer must apply his mind to the question, does it render the inhabited house "injurious to the health of the inmates or unfit for human habitation or use?" Unless he can certify to this effect, no steps can be taken. It will be observed that the formula is "injurious to health or unfit for habitation." I have always held that if any condition is such as to render the house which was intended to cherish and promote the health of the inmates actively "injurious" to their health, then one must further certify that it is "unfit for human habitation." In the majority of cases, however, uninhabitability is merely a legal attitude which must be assumed in order to get into fighting position. This is somewhat unfortunate. It reduces the phrase very much to the position of those expressions of affection and respect with which we close our letters. So long as a perforation in the pan of a W.C., which a drop of solder will stop, and an overflow and deposit of sewage beneath the floors of a house, must be alike certified to render a house "injurious to health and unfit for human habitation," it is no wonder if, in the ears of the law, in course of time, the certificate sounds like a mere form of speech. The real cure for this is to specify by Act or bye-law a long series of easily defined conditions which, being proved to exist, shall be held to be nuisances, and shall forthwith, on notice, be removed. It seems sad to think that, at this time of day, we are virtually allowed to take no account of progress in sanitary knowledge, and are liable to be called upon to certify, and it may be even to prove, that the property of some cantankerous factor is not exempt from the operation of natural law. Meanwhile, I am in the habit of appending to the certificate an N.B., emphasizing the gravity of the nuisance by a more or less graphic description of it, so as to make it clear that the house is, as the children say, "really and truly" unfit for habitation.

---

[1] Paper read at the Congress of the Sanitary Association of Scotland, held in Glasgow on 23rd and 24th August, 1894.

All this refers to the method of dealing with uninhabitability under the Public Health Act, and is interesting as, however imperfect in providing for the reaching of the end in view, it clearly establishes the principle that every house which injures the health of the inmates should, in the last resort, be closed. The clause already quoted from the Scotch Public Health Act and the corresponding clauses in the English and Irish Acts are scheduled in the Housing of the Working Classes Act, in order to their more effectual application under Part II. of that Act. This paper is founded upon the experience of Glasgow in carrying out the same purpose in a still more direct and expeditious way under clause 32 of the Glasgow Police (Amendment) Act, 1890. Shortly stated, this clause enables the police commissioners, by a committee with a quorum of five, on receipt of a certificate under the hand of the medical officer, sanitary inspector and master of works that any house or building, or part thereof, is unfit for human habitation, having heard the owner and such evidence as he may adduce, to close, if they see fit, the premises in question. An appeal is given to the Sheriff. On houses so closed being rendered fit for habitation, the commissioners may revoke their closing order. The Committee on Health has been deputed to exercise those powers. It is summoned *pro re nata*, and meets in the burgh court hall. The clerk to the commissioners reads the joint certificate, and submits evidence that a copy thereof has been served upon the "owner," usually the factor. As a rule, the owner is represented by an agent, who then makes a statement on his behalf. The certificate does not express the bare opinion that the house or premises are uninhabitable, but supports it by an ample array of specific allegations—dampness, darkness, want of ventilation, leaking roofs, and other signs of disrepair, want of latrine accommodation, offensive proximity of ashpit, and so on. Notes are made from personal inspection of the defects of each several house, but they are certified, as far as possible, in groups, having major defects in common. The first question put by the court is, "Do you admit that these allegations are correct?" They seldom are seriously disputed. Tenants have been produced in defence, but that is always a mistake. Architects, factors, or others, give the owner's version of the facts or explain proposals for remedying the admitted conditions. The certifying officials are present to supplement or support their certificate. When anything like a clear issue arises between the official certificate and the case of the owner, the court will adjourn to inspect the property in question—a step which is always disastrous to the owner, for no words can convey to the mind a full idea of the actual conditions. The statement with which agents most frequently open their case is, "This is the first we have heard of those complaints regarding this property. We are anxious to do everything required by the sanitary department. No notice has ever been served upon us regarding these matters, and we think this rather unfair." This is not always a perfectly accurate statement, but the court has invariably replied that it is the duty of proprietors to keep themselves acquainted with the state of their property. The admission that notice from the sanitary department first informed them of the facts before the court proves that they are in default. Thus, either after more or less discussion, or, at once, by the non-appearance of the owner, or his prompt admission of the contention of the certificate, the issue of the closing order is arrived at, and the only point left for consideration is the date of its taking effect. The interests of the tenants alone are considered. Sometimes an endeavour is made to induce the court to suspend the order for a lengthened period, with the intention meanwhile of effecting structural improvements. Such overtures are always rejected for the obvious reasons that the house is injurious to the health of the inmates from day to day continuously, and that the conditions causing this cannot be removed while the house is inhabited. Hitherto, closing orders have always been pronounced to take effect in one month; and the court informs the owner that nothing will give it greater satisfaction than to revoke the order when the officials certify that the houses have been made habitable.

I have been thus particular in describing the method of working the 32nd clause, because of the novelty of the procedure. As we have seen, the principle that an uninhabitable house ought to be closed until it is made habitable is admitted and laid down in the statute law. The question is, how best to carry out that principle? In Edinburgh and Glasgow, and, with a much restricted application, in England by byelaws under the Public Health Act, the local authority, as advised by their officials, are entrusted with this duty, and, as it seems to me, with good reason. The question of habitability is not one of law, but of fact. The facts are mainly facts of observation, the existence of which, in case of dispute, the senses of police commissioners are as capable of perceiving as those of any lawyer or doctor in the land. Then, having your facts, you have to apply a standard of habitability, which, after all, is not a figment of medical officers, or a thing to be dogmatically applied by experts, but is essentially the application of the golden rule. Who better fitted than the representatives of the citizens to apply, with this sense of moral responsibility, their judgment as business men to the determination of the question of habitability? Of course, there are special risks attending representative administration to which I merely vaguely allude, to show that I am not ignorant of them. I now have to do simply with Glasgow, where, in my opinion, the procedure introduced by the 32nd clause has worked admirably. I believe experience is to the same effect in Edinburgh. The new powers were first applied in March, 1891, and, up to last July, 282 houses, belonging to over 40 proprietors, have been dealt with. A closing order has been issued in every case. No appeal has been made to the Sheriff, excepting in one, and that on a technical point not involving the merits. Only 16 houses have been made habitable, so that the order could be revoked—a fact which expresses the simple truth that the remainder were so bad that it was impossible to patch them up. No complaint has been made of injustice being done, either through the press or by any association either of landlords or house factors. I am therefore justified in claiming for our 32nd clause the credit of unqualified success.

We have now to speak of 282 uninhabitable houses, of which 237 were inhabited. On former occasions I have endeavoured to arrange some facts for the use of social reformers regarding the One-roomed house and the Ticketed house, and those who live in them. I now desire to do the same as regards the Uninhabitable house. *Facts* relative to social matters are now-a-days more than ever necessary.

As to why the uninhabitable house is uninhabitable I need not, in view of what has already been said, say much more. Words give a very inadequate conception of the facts. We say "damp" when the hearth-stone never dries, when the joists are buried in earth and rotten, or the bits of old carpet or waxcloth spread on the planks to cover the holes are wet and mouldy, when the hand applied to the wall is soiled with wet size-colour. We say "defective in light" when, in the brightest and longest summer day, the gas, or more usually a paraffin lamp, is kept burning, and when often, in the extremity of poverty, there is no artificial light but a glimmer from a handful of red ashes, and, going in off the light outside, one hears voices, but can see no one. We say "out of repair" when the walls are as bare of plaster inside as outside, when the lathes of the ceiling are naked and broken in, when the skews are bare and the rhones gone and the sky is visible through the tiles or slates, and the rain-water runs down the walls; when the bricks in the partition are as free of mortar as the stones in a dry-stone dyke, and the people have stuffed paper into the crevices with their knives to stop the draughts. We say "want of ventilation" when the house door opens off a court with a window beside it, and if you go to the innermost recess of the apartment the air seems to be a sort of residue of all the breath that has ever been breathed in it.

Comparative Rent and Cubic Space in Ticketed Houses, Improvement Trust Model Buildings, Houses of Workmen's Dwellings Co., and Uninhabitable Houses.

ONE ROOM.

Class of House.	Total Cubic Space.	Average number of Inmates	Cubic Space per Inmate.	Rent.		
				Per Month.	Per Inmate.	Per 100 Cubic Feet.
					D.	D.
Improvement Trust Model,	2,213	2·92	758	13/4	54·8	72
Workmen's Dwellings Co.,	1,189	2·25	528	8/7	45·77	87
"Ticketed," - - -	1,058	3·17	334	7/11	29·96	90
"Uninhabitable," - -	1,265	3·08	411	6/5	25·0	61

TWO ROOMS.

Improvement Trust Model,	3,158	4·29	736	16/4	45·7	62
Workmen's Dwellings Co.,	1,964	3·51	563	11/7	39·6	71
"Ticketed," - - -	1,725	4·66	370	10/3	26·39	71
"Uninhabitable," - -	1,690	4·24	398	8/6	24·0	69

The uninhabitable house is always a small one, practically either of one or two rooms. Of the 282 dealt with, 223 were houses of one apartment, and 52 of two apartments. They were all ticketed, and the fact that 16 per cent. were untenanted shows that they were rapidly falling below the standard even of the class who inhabit uninhabitable houses. Of the 237 occupied houses, 40 were held in lots by persons who farmed them out in rooms furnished to nightly lodgers, generally families. I have constructed a table on the plan of that at page 14 of my pamphlet on ticketed houses.

The *average air-space* of an uninhabitable house of one room is 1265 cubic feet; the average number of inmates is 3.08, so that the average air-space per inmate is 411 cubic feet. The average air-space of an uninhabitable two-room house is 1690 cubic feet; the average number of inmates is 4.24, so that the average air-space per inmate is 398 cubic feet. These figures show that so far as the average goes these houses were not overcrowded; but then we know that on the average "ticketed houses" never come out overcrowded, though in point of fact night inspection shows that nearly 13 per cent. are so.

What do those who inhabit uninhabitable houses pay for the accommodation? The average monthly rent of a one-room house is 6s. 5d.; of a two-room house, 8s. 6d. This represents 25 pence per head accommodated in the former and 24 pence per head in the latter. Reducing the rent to a unit of air-space obtained, we find that 1000 cubic feet costs 61 pence in a one-room and 69 pence in a two-room house. The table enables us to give some meaning to those figures by comparison with the mass of ticketed houses, with the Improvement Trust tenements, and with the property of the Workmen's Dwellings Co. It is quite evident, in the first place, that the uninhabitable house constitutes the cheapest of the ticketed houses. The average rental of the ticketed house of one room is 7s. 11d., as compared with 6s. 5d.; and of the ticketed house of two rooms, 10s. 3d., as compared with 8s. 6d. In the one-room ticketed house the cubic space costs 90 pence per 1000 feet, as compared with 61 pence; and in the two-room house 71 pence, as compared with 69 pence. This is evidently a fresh illustration of the old saying—cheap and nasty. After all, even without discount for the nastiness, are these uninhabitable houses cheap at the money? If we turn to the Glasgow Workmen's Dwellings Co., we shall see how an honest article compares with this fraudulent article in the market. They own 95 one-room and 108 two-room houses, consisting partly of new property specially erected, but mostly of notorious tenements of ticketed houses now reconstructed and made thoroughly wholesome. The rent of an uninhabitable one-room house is

6s. 5d. per month; of a Workmen's Dwellings Co.'s house 8s. 7d. The cost per 1000 cubic feet of uninhabitable air-space is 61 pence; per 1000 cubic feet of wholesome air-space 87 pence. The rent of an uninhabitable two-room house is 8s. 6d. per month; of a Workmen's Dwelling Co.'s house, 11s. 7d. The cost per 1000 cubic feet of uninhabitable air-space is 69 pence, while the Workmen's Dwellings Co. supply the same quantity of a wholesome article at 71 pence, or only twopence more.

The question—*Who inhabit uninhabitable houses?*—is not so easily answered, because the answer cannot be expressed in figures. It involves the element of character, and character has no dimensions. In the main it is a matter of opinion. Still, there are some precise data which may help us to form a general conception of the inhabitant of the uninhabitable house. He is obviously *nomadic*. You become aware of this in the course of your inspections. If the property is not certified speedily, the names of your tenants require to be changed. In point of fact, if you note the length of occupancy of each tenant who holds direct from the factor, you will find that half of them have lived in the house in which you find them less than one year; and a third of that half, or nearly 17 per cent., less than one month. Then there is the large class of what we may call "uninhabitable casuals," to whom 36 per cent. of the uninhabitable one-room houses are farmed for nightly payments of 6d. or 8d. But all the tenants of uninhabitable houses are not nomadic. You will find, even in the worst tenements, instances of prolonged tenancy which attract your attention like ancient buildings in modern streets. Amid all the coming and going, the racket and rowdyism, these people have remained for 10, 20, 30, even 40 years—a notable fact, deserving close scrutiny as to its meaning, but which meanwhile we merely note and pass on.

If we ask the *employment* of the inhabitant of the uninhabitable house, half of the male householders return themselves as "labourers," half of the female as simply the housekeeper. The other half, in the case of the men, are shoemakers, firewood choppers, carters, and a long miscellaneous list of tradesmen of all kinds, while in the case of the women they are cleaners and washers, hawkers, millworkers, &c. There can be no doubt that in the case of the men, excepting those who call themselves "labourers," the designation of the others is but a mark to indicate the high estate from which they have fallen.

Thus we are brought to the expression of the opinion formed from personal observation of those who inhabit uninhabitable houses. I have been in their houses, have spent much time talking with them, and my opinion is that in the main they are the *débris* of the city, the chips and dishonoured stones which fall from the social structure and litter its base. There are the open and undisguised bad, the criminal and immoral, the obviously good, and the enigmatical and mysterious, who are in truth most probably bad. I should estimate the good at some 10 per cent. of the whole, including a few rough souls who are not exactly teetotallers, but who confine their potations to Saturday night and Glasgow Fair, and as a rule work hard when they can get work to do. Indeed, the uninhabitable house is pervaded with the smell of whisky, predominant over all the other smells. The thief and the prostitute are borne along by it through their brief and unhappy lives. You go into one house and you find that twins have been born a few hours ago, and a knot of neighbour-women sit round the bed, and the mother and her friends are alike maudlin with whisky. You go into another house where at your last visit you saw a child very ill, and you see the mother huddled up on the top of the bed sleeping a drunken sleep, and you know that the child is dead. They baptise with whisky and they bury with whisky.

The inhabitant of the uninhabitable house follows the usual law of stratification or assortment. One comes to know the lair of the criminal. It is always the back land where watch is readily kept, where defence is easy and attack difficult, where shame is unknown and honour is of the quality which prevails among thieves. When at noonday you find all the men about playing cards or loafing in the closes and on stairs, and superfluous women lolling over windows or nursing black eyes in corners, you can have no doubt of the calling of the inhabitants. The sanitary official sees them as no one else sees them. They receive him frankly. He takes no notice of the evidence of gruesome business he sees about. His eyes are only for the leaking roof or the damp wall. The man with short-cropped hair shows where the drip comes down over the bed, and the frowsy woman asks if you are going to put "the poor unfortunate" out of their house again? The 32nd clause has broken up several such retreats of vice. It is in such quarters you chiefly meet with the mysterious and enigmatical tenant. There is the house in which you are told So-and-so lives, but you never can find him in or get clearly to know what he does, for information as to the comings and goings of people in those localities is difficult to get, but the sanitary man never tells the police, and so you at last learn that Mr. So-and-so does a shebeen business and really lives in a more reputable locality except from Friday or Saturday until Monday, when he inhabits the uninhabitable house. Another mysterious personage is the tidy, respectable-looking, old woman who lives right in the middle of the recesses of the back land, in a house of two or even three apartments, which differs from all the rest in that it looks clean and comfortable—the worn boards of the floor scrubbed white, and the bedding clean though poor, with some attempt at bizarre decoration. She is always alone, but she tells you she has a goodly detail of sons and daughters at work, as they ought of course to be. She follows you about in your inspection, softly deprecating every criticism—the stains on the ceiling are old; the laird put on some slates after the last storm; she is going to lime-wash it to-morrow if her rheumatisms are better; the midden below her window has no smell whatever; it is as sweet and airy a house as ever she was in. An unwary social reformer or lady visitor would certainly fall in love with this old lady, but somehow she reminds me of the Book of Proverbs. It is not always a good sign to find an uninhabitable house clean and tidy.

Uninhabitable houses which are found in front lands or in single-storey ranges like "colliers' rows," abutting on some unbuilt space or ranged round three sides of a square, are usually occupied by colonies of unskilled workmen and labourers, who may be rough in their ways and find their only relaxation in whisky, which now and then leads them to the police-court as "riotous and disorderly," or "drunk and incapable"; but they are very different from the vicious and criminal people of the back lands.

But what about the sprinkling of undoubtedly decent people one finds in those uninhabitable houses, especially those who have lived long years in them, whose rent-book is always duly discharged? What is their history How came they there in such incongruous company? Why do they remain? There are the two old women living in a garret at the top of a stair, the bottom of which is blockaded by the physical darkness which in the daytime can be penetrated only by the help of a match, and by the still denser moral darkness of the unhappy people who hold the lower flats of the tenement. I had worked up and reached the end of my inspection, and knocked at the last door. I cannot forget my astonishment when after some delay it was opened, and I found myself in the presence of two old ladies, each with their seam. I took without hesitation the proffered chair. There was no carpet, but a well-scrubbed floor—a very scanty plenishing altogether, but a clean fireside, and you felt you had found a shrine of godliness and industry where you least expected it. Next we have the two old bill-stickers, who lived in a land where the partitions were of ancient panelled wood—a method of sub-division which might do in quiet society, but which when you have thieves and prostitutes all around, is no better than the paper partitions of Japan. There are the cases of a scavenger who had lived for 28 years in a one-room house in a tenement every other room in which was farmed out to casual lodgers of the lowest type, and the close by which he entered was haunted even in the day by bad characters, and made noisome with naked vice; of the old widow who for 14 years had inhabited an uninhabitable one-room house, with a ceiling 7 feet high, dark, damp, and in total disrepair—her sole companion a gaucie tomcat—in the far recesses of a court which must have been like pandemonium at night. I must also introduce the old firewood-cutter, tenant, with his wife and lodger, of a two-room house, dark as a primitive cave dwelling. For years that old man has been familiar to me. You could see him through a small window, which could admit no light because it opened into a narrow close, sitting, with his pale, shrivelled face visible in the light of a paraffin lamp, sorting sticks in bundles, and tying them up with string. At any time of the day there you would see him industrious to the full extent of his feeble ability. He had been 13 years in this house. I had the satisfaction of seeing him a few days ago in another two-room house, the rent of which is 8s.—the same as he paid for the uninhabitable house which he was compelled to leave. He was as usual busy bundling sticks, now in the wholesome light of the sun, but its brightness was eclipsed for him by the death of his old wife, as he told me with tears. I cannot close my gallery of portraits without pointing to the most interesting of them all—"Salvation Sal"; not that that was her name, but I have somehow come to call her so in my imaginings—a sturdy woman of say 50 years, with a rugged face, bearing many a scar got in the service of the devil, but every rough feature now instinct with the soul which had at last gained the victory. Her voice and her movements were full of nervous energy. She lived by cleaning a warehouse. Her house was the only one taken direct from the factor at a monthly rent, in a miserable dilapidated tenement in a narrow *cul-de-sac* wholly farmed out to hawkers, beggars, and street-walkers. The floor was earthen, but with her own hands she had papered the damp walls and painted the wood-work. It was on the ground floor in this narrow passage and so was very dark, but to send the light further into its recesses she had whitewashed a square of the opposite wall. The chief attraction this hovel had to "Salvation Sal" was that she had been converted in it. She would point with a dramatic gesture to a part of the earthen floor and tell you that it was on that very spot the Lord found her one Sunday morning, when she awoke to discover that she had "pawned the very shift off her back," and fell on her knees and vowed to drink no more. She used a phrase to indicate her wickedness which I had never heard before, and have not heard since—"I was a real bad cup o' tea." Poor Sal was troubled with a bad husband, who frequently got drunk, but she said she always walked up and down in the passage until he fell asleep, for she was afraid her old tongue might break loose and blows arise, but she hoped the Lord would some day convert him too.

Gentlemen, I am afraid some of you may in this *fin-de-siècle* smile at Salvation Sal's old-fashioned phraseology, if not at me for believing in her, but you remember how Carlyle has recorded that it was in Leith Walk, at a precise spot which he never forgot, that he "authentically took the devil by the nose," and he says, "It is from this hour I incline to date my spiritual new birth; perhaps I directly thereupon began to be a man."

The case of these people is intensely interesting to me. They are the salt of the otherwise festering population of the uninhabitable house, the ten men for whose sake peradventure they will not be destroyed. As a lad the story of the backwoods man used to fascinate me, with the curl of blue smoke from his solitary hearth rising over the trees of the primeval forest, the ambushes and stratagems of the day, the weird noises, the phantom shapes, the war-whoops and sudden onslaughts of the night. Just such a life do those people live. Their doors are always locked. They open them with caution, and they shut them before, under their breath, they speak about their neighbours. Their uniform answer is that they have no intercourse with them. As the old woman with the tomcat said, "I slip in and I slip out. They dinna meddle wi' me, and I dinna meddle wi' them." The fact is, the friendship of such neighbours is as objectionable as their enmity. It consists in perpetual borrowing of pence to get things out of the pawn, of furniture and utensils which never return, even begging of pinches of salt, slices of bread, or tea and sugar—a process like having your flesh picked off your bones. Think of them then here and there in the closes and wynds of Glasgow, like the backwoodsmen among the Indians, moving out warily in the day light, keeping close inside in the dark, with the storm of the drunken brawl bursting on their ears from the court beneath and the noise of the drunken dosser in the lobby or the kick of the fuddled man who has mistaken the door breaking in upon their sleep, making the heart for the moment falter with fear. But you say, as I have often said—"Why do they remain there? Why does the native of St. Kilda stay there? Why do the inhabitants of Achill Island stay there?" It is often difficult for one human being to understand the action of another, because we always look through our own eyes and appreciate our own motives. I think, however, I can bring these people fairly into line with the rest of humanity. The majority are remnants of a previous generation of respectable tenants, all of whom have gone, as the property deteriorated. Well, in any of the old residential streets of Glasgow or in the suburbs, you will find old people spending the last of their days in houses which are now isolated in rows of business premises or shut in by tenements built upon their lawns and gardens. A few have formed little businesses in connection with their houses—firewood-making, coal-selling, cobbling, &c.—and we all know how loth we are to shift in these circumstances, and how the interests of our family life are apt to be sacrificed to those of our business. The solitary women and old couples usually have some subvention from the parish, church funds, or other sources. None of these people have children about them and few have even young people—a fact which deprives their position in such localities of much of the possibility of either physical or moral mischief. After all has been said to account for the presence of the ten righteous in the uninhabitable house, I am bound to believe that there is a process of moral and physical acclimatization. Indeed, the shock which we experience from seeing indecent actions and hearing blasphemous words is largely physical; and just as sleep may be unbroken by sounds to which we have become accustomed, so the ear and the eye may cease to convey to the understanding and the heart of these good folk sounds and sights which would fill our imaginations with gross conceptions.

You have probably been surprised that I have said nothing yet about *the death-rate* in the uninhabitable house. In Glasgow we have got beyond the stage of sanitary evolution when every nuisance must be labelled with its precise contribution to the death-rate. We don't believe that we shall ever come upon an uninhabitable house which is wholesome and a blessing in disguise. I am therefore never asked to prove that those houses do not conduce to longevity, and I never proffer such evidence. But I may tell you that I generally have it where the heathen Chinee keeps his reserve of cards. There are three characteristics of the uninhabitable house. (1) The deaths always exceed the births. It destroys more life than it produces. (2) The infantile death-rate is enormous. (3) The general death-rate is mediæval in its dimensions. As an illustration—in one of the last lots closed, during the last five years there were 27 deaths and 19 births. The death-rate under one year was more than 26 per cent. of the children born, the city rate being 15 per cent. The general death-rate was 58 per 1000, the city rate being 24.

The important question—*Who own uninhabitable houses?*

—may be very shortly answered. There were 41 proprietors involved, and only 21 of these were individuals. The remainder were either trustees or executors or joint beneficiaries. This has an obvious bearing on personal responsibility. It behoves every person occupying the position of a trustee to enquire into the character of the property which he administers. It behoves every person who is a beneficiary of a trust to ascertain whence the rents are derived. Moral responsibility is not the less real because the rent is pooled by trustees and then distributed. As for the individual proprietors, they live in houses in the west-end, in villas in the suburbs, at coast and in country. Probably no one would be more astonished than those persons themselves if they were told that they had been living upon the proceeds of such property. But to plead ignorance is to plead guilty. If they did not know they ought to have known, and this is the lesson I would impress upon all owners of house property whether as individuals or through trustees. Upon you the responsibility lies. Factors may represent you under the 32nd clause, and so keep your name from a publicity which, in the circumstances, would be richly deserved, but nevertheless on you and your ill-got rents I am old-fashioned enough to believe a curse rests which will be sure to find you out. Just think of it. They are collected from week to week and month to month by your agents at the doors of those houses. It may be, the very coins which are the reward of iniquity are put into their hands. It is all the same as if you stood at those doors and held out your own hand for the money. But no! you send someone else to get it, and perhaps you give a subscription to the Home Mission or the Social Union, or you discuss the great city Babylon in your drawing-rooms, and you stand afar off and bewail and lament when you see the smoke of her burning.

The question—*What is to be done with the uninhabitable house?*—has been answered already: shut it up until it has been made habitable. If operations are not begun at once for its restoration, the structure soon disappears. In twenty-four hours there will not be a pane of glass unbroken; in a week the window-frames, doors, and woodwork generally will be on the move; soon the demon boy will make his way through the roof, and so the work of destruction goes on until the very walls are levelled. As I have already said, only 16 out of the 282 houses dealt with have been restored and reopened. They were all one-room houses of the "colliers' row" type, occupied by the rough unskilled labour class of men. The rents of six houses were raised 18 per cent., and of nine, 20 per cent. The old tenants for the most part returned to their houses at these rents. The net result is, therefore, 16 houses restored to the market in a wholesome condition, and 266 condemned and withdrawn from the market, like the unsound flesh or fish which is constantly being seized by our food inspectors. This may seem to some but a poor result of the application of powers which would enable us to deal with all the uninhabitable houses of Glasgow. But those who hold the helm of affairs in a large city must occupy the conning-tower and watch what is going on around. Your president and I have had many an anxious conversation about this 32nd clause. The question is not merely what is to be done with the uninhabitable house, but what is to be done with the people who inhabit it? It is for the sake of the people that the houses are closed. It must be remembered that you are dealing with quite a limited section of the population. Those 282 were " ticketed " houses. I have elsewhere estimated the number of ticketed houses at 23,000, and the number of their inhabitants at 75,000, and I have said—" Those 75,000 people comprise not only the criminal class, but the whole social *débris* of this large city; some who are bravely struggling with poverty, and far more who are alike bankrupt in character and in fortune " (" Ticketed Houses of Glasgow "). We have seen how accurately this description applies to the inhabitants of the uninhabitable house. What, then, is the result of disturbing such people? The effect as regards the bad is like nothing so much as the driving away of a swarm of flies from a raw place on an animal. They rise in a flight and settle down upon the nearest other raw place. Your criminal and your drunkard look out for the nearest property where they will be received, and that is sure to be but a little better than the place they left. For the compact between the tenant and the landlord of such property is an immoral compact. The necessity of finding house-room makes the vicious and criminal person accept any hovel; the consciousness that he has an unsound article to sell makes the landlord accept the criminal and the vicious as his tenants. The object to be aimed at by the sanitarian is to make such a compact impossible by taking away the only reason the landlord has for entering upon it—the fact that he is possessed of an unsound article. But caution is necessary. In Glasgow of late there has been an immense work of destruction of unwholesome property and consequent disturbance of this restricted part of the population, quite independently of the 32nd clause. I have received most interesting statements from Mr. Menzies, manager to the Improvement Trust, of the operations of that Trust during the last five years, which show that there have been demolished—

311 houses rented at £5 and under.
265 do. at above £5 and under £10.
27 do. at £10 and upwards.

There have been erected—

169 houses rented at £10 and under.
102 do. at above £10.

There have been reconstructed—

47 houses rented at £5 and under.
99 do. at above £5 and under £10.
9 do. at £10 and upwards.

In the same time the Glasgow Workmen's Dwellings Company have bought and reconstructed certain notorious tenements, containing 82 one-room and 65 two-room houses. They have also erected new tenements, containing 13 one-room and 43 two-room houses. These demolitions are special and extraordinary, over and above the continuous destruction of house property of inferior quality in the course of railway construction, business extension, and other changes incident to the growth of a city. I find also from the sanitary inspector's report that, during the three years which have elapsed since the Police Amendment Act was passed, 3755 W.C.'s and 455 sinks have been introduced into tenements.

Now, what is the general result of all this to the householder? In every case of demolition and of reconstruction, the original occupants are first of all dispossessed. Then the process of selection begins. No owner of new property will look at the old tenants. Apart from this, it is evident from the rents of the Improvement Trust new property that they are not within reach of the old tenants. The rents of the Workmen's Dwellings Co. tenements are within their reach, but, all the same, their character shuts them out. Similarly, in the case of every reconstruction which begins with the eviction of the tenant, the opportunity is taken to purge the rent-roll of all persons who are undesirable as tenants. The 10 per cent. of good tenants may go into the promised land, but the 90 per cent. of bad are compelled to wander in the wilderness. Truly the way of transgressors is hard. It is intended to be so. In the testing of principles, there is nothing like pushing them to their extremes. Supposing *every* landlord said, "I shall not lay out a penny on my property, I can always get somebody to inhabit it; I shall not put a slate on to keep the water out or replace a rhone to keep the wall dry, or repair the paving of the court to prevent pools of stagnant water, or lift a choked drain though the tenants are wading in sewage; I shall listen to no complaint of tenant until I get a notice from the sanitary department, and then I shall put off as long as possible, and lead the authorities through every possible form which involves delay." There are landlords who do this, or their factors for them; but suppose they all did so, what would be the state of the city? I need not attempt the description. It would require an artist of the impressionist school, with a very large canvas and a liberal supply of the primary colours. Supposing, on the other hand, every landlord said, "I shall keep my property in thorough repair; I shall inquire into every complaint from my tenants, and attend to every notice from the sanitary department at once; and by inspection shall endeavour to anticipate those complaints and notices; I am determined not to harbour thieves and prostitutes; I shall not put up with the drunkard and the midnight brawler; I shall not make the world easier to live in for the profligate and the unclean." The majority of landlords and factors set before themselves this standard of business. Why not all? If all, what then would be the state of the city?

Gentlemen, there are many schemes of social restitution before us at present. The oldest of all is in the Bible, and it is based upon righteousness—not righteousness in the air or in the earth, in this or in that, but in the individual. I fancy that if we would all leave off talking, and each look to the fragment of responsibility which lies at our own door, we should do more to bring on the golden age of human hope. If I were desirous to promulgate a theory of social reform, I would base it by preference upon the higher morality of house-owning—a very broad basis, because it includes not merely the landlord and the factor, but the trustee, the beneficiary, the bondholder, and it touches every tenant. No matter through what channel the rent of the uninhabitable house reaches our pocket, it brings a burden of responsibility with it. Let us not for gain make broader the way which leads to destruction both of soul and body.

COMMON LODGING-HOUSES.[1]

Ladies and Gentlemen,—If you wish to learn something of what the "Common Lodging-houses" of Glasgow really were before the era of police and sanitary regulation, I would refer you to a little book published last year by one of our local booksellers, entitled "Hawkie, the Autobiography of a Gangrel," edited by John Strathesk. Hawkie was a well-known Glasgow character in the first half of this century—a beggar, street orator, and wit—who amused the closing years of his erratic life, spent in the City Poorhouse, with the composition of this autobiography. The original is couched in the purest Glasgow Scotch, spelled phonetically, but as published it is translated into decent English, and is an authentic record of the experiences of one of those "Jolly Beggars" immortalized by Burns.

---

[1] Paper read at a Conference in Edinburgh, March, 1889.

The exuberant genius of the picture drawn by the poet *may* make us forget "the pity of it," but there is a naked, unadorned realism about Hawkie which presents nothing to divert our minds from the moral and physical horrors of his story. Lodging-houses were in those days high places of debauchery and disease. There was no house too miserable for the purpose, and no limit to the number admitted. One result was that to keep a lodging-house was one of the surest and quickest ways to fortune. As Hawkie says :—"These most notorious characters, lodging-house keepers, are suffered to take an old house, perhaps an old stable or condemned house; they start a lodging-house, which, every second night, will return their original outlay." He gives in the course of his story many examples from his own experience. He tells us of a place at the foot of the Old Wynd, "a celebrated spot called the Flea Barracks," the precise location of which he fixes by those landmarks. "This place was on a ground floor near a dung heap." We read of a house of two apartments, only one having a fireplace, in which he had seen as many as 40 lodgers at one time, at 3d. per head. Then there was Billy Toye's "in the entry from the Old Wynd to Jeffrey's Close." The house rent was £6, and he took 10s. per night out of his beds or "snoozes." No wonder that Billy was able in nine years to give up his lodging-house and purchase a farm in Ireland. Another man is mentioned who in four years saved £200, and when he emigrated the whole plenishing of his house only fetched 9s. Although I select these illustrations from Hawkie's experience in Glasgow, I am bound to state that there was scarcely a town or village in Scotland south of the Forth, or in the North of England, in which he had not lodged, and that in them all his allusions and stories show the same savage conditions of life, with their necessary results, recklessness, immorality, and disease. The worst form of barbarism is that which gathers at the base of civilisation, and here we had it in perfection.

The lodging-house contains not only the men and women who are striving to live by honest labour, though it is of such a fickle or ill-paid kind, that they are never even a day ahead of their wants. There also we find the criminal, at open war with society and the whole *débris* of the social structure. Neglected, they form together a fermenting mass of moral and physical putrefaction. The history of lodging-house reform and regulation is the old one. It sprung from the necessity of self-preservation being borne in upon the respectabilities in the upper tiers of society. If some disease-proof partition could have been erected which would have prevented the spread of the flames of fever, the inmates of the comfortable houses would have thanked God that they were not as these other men, and left the fire to die away among the ashes of its victims. But happily such is not the order of the universe. Typhus and cholera established their headquarters in the common lodging-houses. Their wretched inmates not only died there, and had to be buried at the public expense, but in their nomadic movements they carried these plagues far and wide. Common-sense taught us that to root out the Barbary pirates we must bombard Algiers, and the statutory regulation of lodging-houses was resorted to from the same homely view of the situation. I refer you to Dr. Glover's historic Report on the Common and Model Lodging-houses of the Metropolis, with reference to epidemic cholera in 1854, for evidence of the immediate and remarkable result. He proved that the inmates of the ordinary lodging-houses "suffered less from cholera than almost any other class in the metropolis," and that the inmates of the model lodging-houses "enjoyed all but complete exemption from the epidemic." It is worth while quoting the conclusion of this report, written 34 years ago, to show you how old are the lessons which societies such as yours are repeating, and still endeavouring to drive home the practical issues. Dr. Glover says:—"The facts adduced in the above report appear to me to prove that in proportion as you improve the dwellings of the people and secure them proper ventilation, good drainage, sufficient supply of water, and inoffensive water-closet accommodation, you advance the standard of their general health, and exempt them from cholera and other epidemic diseases. . . . More difficult to express in figures, but not less certain, are the still greater benefits which may with confidence be anticipated from rendering houses comfortable and healthy, such as the enhancement of the domestic affections, the correction of vicious habits, and the opening the way for the admission of the higher and holier influences of religion to the most numerous and hitherto most neglected classes of the community."

I have thus introduced the subject of model lodging-houses, of which we have 7 in Glasgow, and regarding which I am led to understand you desire some information. Glasgow is a city in which the keeping of lodgers may be said to be so prevalent as to be a serious social disease. At the census of 1871 it was found that 23 per cent. of all our families contained lodgers besides their natural constituents. If we put this fact alongside of the other fact that 20 per cent. of these families with lodgers were dwellers in one-room and 48 per cent. in two-room houses, you will admit that I am amply justified in regarding the tendency to keep lodgers as a serious social disease. To introduce strange men and women within the narrow limits of those small houses must demoralize the family, and precipitate the tendency to moral and physical degeneration, which is inherent in the one and two-room house. When the Improvement Trust began to clear out the areas scheduled under their Act, and to consider what was to be done to provide accommodation for the inhabitants displaced, it was found that a large proportion were lodgers. Very careful inquiries were made, which showed that in 14 per cent. of the one-room houses, in 27 per cent. of the two-room houses, and in 32 per cent. of the three-room houses there were lodgers. While we were satisfied that sufficient and satisfactory accommodation, provided by the ordinary processes of private enterprise, existed for the reception of families as such, it was obvious that the migratory casual lodgers would only extend into other small houses and intensify the practice of receiving strangers into the crowded family circle of the poor, which their condition, even under the control vested by statute in the authorities, had satisfied us was not to be desired. Besides, as carried on, the private business of a common lodging-house keeper was evidently a lucrative one. It returned usurious interest upon the capital of the proprietors, but under conditions which were thoroughly immoral in the sense that the accommodation was inferior, the discipline lax, there was no premium upon virtue, the miserable pence of the lodger were the first and only consideration; he might be drunken, or obscene in language and conduct, he might come and go at any hour. Poverty drove the homeless into circumstances in which contamination or deterioration of the whole being were inevitable. The Improvement Act contained powers to erect and maintain dwelling-houses for the displaced inhabitants, and for a double purpose it was determined to provide for the waifs and strays among them. To use a word with which we are now becoming familiar, it was thought that by building *model* lodging-houses the lodgers might be elevated and the keeping of lodgers might be "moralized." It might be shown that the business of a lodging-house keeper could be conducted so as to be at once moral and commercial. I hope to satisfy you that both ends have been attained. Between 1871 and 1879 seven model lodging-houses were erected in as many different industrial centres of the city. In round figures they cost £87,000. They contain 1922 beds, so arranged that each has a private compartment, with 400 cubic feet of air space. I need not enter into any detailed description of the various attached comforts and conveniences—the reading-rooms, dining-rooms, baths, cooking, and washing facilities, &c. You will soon have in the Grassmarket, provided by private enterprise, a model lodging-house in which all that is good in our models has been copied, and many features have been so improved upon that we shall have in return to take further lessons from you. Only one of these model lodging-houses, containing 96 beds, is reserved for females. It has given more trouble both financially and in respect of discipline than the other houses for males—a fact which has its melancholy meaning. The woman who has, from whatever circumstances, been divorced from home-life, drifts further from self-respect and good living than the man. The males pay 3½d. and 4½d. per night, and the females 3d. Let us now turn shortly to results.

Financially, those houses have been a success. They have returned an average of 4¾ per cent. on their original cost; and this including a period of great depression in trade, when the demand for beds was not always sufficient to keep them full, which they now generally are in spite of the competition of private parties. This is another result and the best evidence also of their commercial success. There are now at least three large model lodging-houses conducted by private parties, drawn to the business just as men are led to embark in any enterprise which they see yielding a profit to other people. One of these houses contains 510 beds, while the largest of the original houses only contain 328 beds. The business has thus been so far "moralized."

As to the inmates, their moral and physical elevation cannot be presented in exact numerical statements. They must go to bed at the latest by half-past ten, they must turn out at 8 a.m. No spirituous liquors are permitted to be brought into the house. No gambling, quarrelling, profane or indecent language, or noise of any description, or any conduct calculated to disturb peace and good order are allowed, under pain of expulsion. Then consider the humanizing effect of being cared for. The evidence of this care is in the first place the mere fact that such accommodation has been provided by the community. There are few so insensible to kindness, or so thoughtless as not to reflect when they lay their head on the clean pillow and draw over them the clean bed-clothes, that they ought to care somewhat more for themselves when they are so well cared for by others. Besides, the inmates are placed in circumstances in which it is possible for those who are moved by a sense of their brotherhood and sisterhood to the poorest and meanest of the great family of man, to minister to their amusement by concerts and readings, and to their religious instruction by Sabbath services. It is at least not incongruous to speak of another life to those who have been surrounded with physical conditions which show that *this* life has not been forgotten.

As to health, I can say from an official acquaintance with those model lodging-houses extending over the whole period of their existence, that there has been a complete immunity from infectious disease. The superintendents are instructed to get medical assistance at once in case of illness. It is very rare to find a case of infectious disease originating among the inmates, and we have never found that a succession of cases arises, excepting on one occasion, when small-pox got hold in one of the houses. All medical men will understand how this might occur. Even then the discipline and direct control over the inmates, enabling preventive measures to be adopted with a thoroughness which in an ordinary lodging-house is impossible, made it easy speedily to stamp out the disease. On the other hand, our experience is that infectious diseases, especially typhus, frequently invade the common lodging-house, and spread in spite of all our efforts, unless we can remove all the inmates and shut up the house for a time.

Another incidental advantage to the community has been the dispersion of the nomads of the population, who used to be concentrated in the Central District of the City. In 1871 there were 153 common lodging-houses in this district. There were none in the Northern or Western Districts, and only one or two in the Eastern or Southern. Now there are only 93 in the Central District, and only one outside of it. The total number of those houses has therefore been greatly reduced, and that wholly by their abstraction from the Central District, where the lowest elements of society always tend to collect. This is obviously a change to the advantage of social order and good government.

The last of the benefits which have followed the establishment of these model lodging-houses and their extension in private hands, to which I shall allude, is perhaps the greatest. I refer to their attraction from the small houses, of a large proportion of that evil element in the domestic life of the poor —the casual lodger. The evidence of this is to be found in the records of the night inspections for the detection of overcrowding in our "ticketed" houses. These comprise the smallest of our houses, in which overcrowding is a physical evil, no matter how it arises, but in which no language can adequately express the moral evil which is engendered, when strange men and women are intruded beside man and wife, adult sons and daughters, and young children within the four walls of one room. Of the 23,000 ticketed houses of Glasgow, 16,000 are one-room, and 7000 are two-room houses, and these, as I have said, of the very smallest. In the five years 1872-76, when there was only one model lodging-house, it was found that in 71 per cent. of the ticketed houses which were found to be overcrowded there were lodgers. In the five years 1877-81, during which the other houses were erected, the proportion of overcrowding arising from lodgers was reduced to 65 per cent. In each successive year this proportion has steadily fallen, until in 1888 it reached the lowest point—viz. 29 per cent., as contrasted with 71 per cent. when the system of model lodging-houses was first introduced. These are poor bald figures, but I leave you to judge what they mean in the prevention of the *occasion* of sin and demoralization, and the extension of domestic purity among the poorest of the householders of Glasgow.

ON SOME SOCIOLOGICAL ASPECTS OF SANITATION.[1]

It is a wise usage of this Society which gives the president-elect a year in which he may enjoy the honours of his position without the labour of giving a set address. I confess, however, that this grateful space has been spent in a bewildered survey of the task rather than in a deliberate preparation for its fulfilment. Amid the various subjects which might fitly be brought before this Society, you will, I am sure, recognise my prudence in seeking to discharge my obligation to deliver a presidential address by discoursing to you on "Some Sociological Aspects of Sanitation."

It has happened to me, from time to time, in the course of my life, to have some learned friend shrug his shoulders and drop the hint that my official work, the ultimate object of which is the conservation of life, somehow was opposed to the laws of the universe. These criticisms generally included in their expression the phrases "struggle for existence," "natural selection," "survival of the fittest." I wish now to look into this grave suggestion. The ultimate source of these criticisms is Mr. Herbert Spencer, and I take their full exposition from his book, "Social Statics," and their more recent and popular reiteration in "The Man *versus* The State."

First let me acknowledge that I am heavily handicapped in my task by the personal interest I have in opposing these doctrines—what Mr. Spencer calls the "class-bias," which he defines as "a reflex egoism."[2] It is, however, so far fortunate that I am "in the same condemnation" as the whole medical profession, who, we are told, "moved as are the projectors of a railway, who, whilst secretly hoping for salaries, persuade themselves and others that the proposed railway will be beneficial to the public—moved as all men are under such circumstances, by nine parts of self-interest gilt over with one part of philanthropy— . . . are vigorously striving to erect a medical establishment akin to our religious one."[1] I pass by these and other passages to the like effect with the remark that they are not fair. Doctors live by the treatment of disease, and if, as a body, they have been the chief advocates of methods of preventing disease, which is a historical fact, the circumstance that a small percentage of the total number have thereby obtained official emolument is but a decimal to the credit of the whole professional income, against the vast sum which has been deducted by their aggregate efforts. I trust the allegation of "class-bias" will not prevent the merits of my argument from being considered.

---

[1] President's Address to the Philosophical Society of Glasgow, at opening of 85th Session, 2nd November, 1887.

[2] *The Study of Sociology*, 6th edition, p. 242.

Mr. Spencer sets out from the "law of right social relationships that *every man has freedom to do all that he wills, provided he infringes not the equal freedom of any other man*."[2] Again, "here, then, we reach the ultimate interdict against meddling legislation. Reduced to its lowest terms, every proposal to interfere with citizens' activities further than by enforcing their mutual limitations, is a proposal to improve life by breaking through the fundamental conditions of life."[3] These principles are applied to the whole round of State legislation, as, for example, the Regulation of Commerce, Religious Establishments, Poor Laws, National Education, Government Colonization, Sanitary Supervision. I have no fault to find with the principle, but I question some of its applications to sanitation. I agree heartily with much of the rigid, uncompromising, unanswerable criticism to which the interferences of the State in these various departments of legislation are subjected. Even sanitary legislation furnishes examples of blundering. I agree that the evolution of the individual is best promoted by leaving him, as far as consists with the general well-being, to his own deserts. Paternal government or grandmotherly legislation produces a poor weakling, maintained in the battle of life by artificial props outside of him. The natural incentives of rewards and determents of punishments are inoperative; and deterioration, moral and physical, is the aggregate result. But these are unsatisfactory generalities. It is only when we follow Mr. Spencer into the details of his method of dealing with public health that we can discover whither he would lead us. He maintains that it is not the duty of the State to protect the health of its subjects. Sanitary administration by the State is wrong. Sanitary administration by municipal authorities is wrong. All taxation for sanitary superintendence, being the abstraction from the citizen of more property than is needful for the efficient defence of his rights, is to be condemned. "Be it by general government or by local government, the levying of compulsory rates for drainage, and for paving and lighting, is inadmissible, as indirectly making legislative protection more costly than necessary, or in other words, turning it into aggression; and if so, it follows that neither the past, present, nor proposed methods of securing the health of towns are equitable."[1] Mr. Spencer proceeds: "This seems an awkward conclusion; nevertheless, as deducible from our general principle, we have no alternative but to take to it." Then he goes on to sketch a method of sanitation consistent, as he supposes, with his general principle. I give his own words, for although the passage is long, the best method of criticism is to do so:—"How streets and courts are rightly to be kept in order remains to be considered. Respecting sewerage there would be no difficulty. Houses might readily be drained on the same mercantile principle that they are now supplied with water. It is highly probable that in the hands of a private company the resulting manure would not only pay the cost of collection, but would yield a considerable profit. But if not, the return on the invested capital would be made up by charges to those whose houses were drained: the alternative of having their connections with the main sewer stopped being as good a security for payment as the analogous ones possessed by water and gas companies. Paving and lighting would properly fall to the management of house-owners. Were there no public provision for such conveniences, house-owners would quickly find it their interest to furnish them. Some speculative building society having set the example of improvement in this direction, competition would do the rest. Dwellings without proper footway before them, and with no lamps to show the tenants to their doors, would stand empty, when better accommodation was offered. And good paving and lighting having thus become essential, landlords would combine for the more economical supply of them."[2]

---

[1] *Social Statics*, 1868, p. 409.

[2] *Social Statics*, p. 121.

[3] *The Man versus The State*, p. 105.

If you say this is impracticable, Mr. Spencer replies that therein lies the virtue of the scheme; for the impracticability arises from the imperfect morality of mankind, and perseverance in these impracticable methods will elevate the general morality until it becomes practicable. If you say, out of the intermediate chaos will arise disease, which will involve good and bad, moral and immoral, in one common destruction, he welcomes disease, especially epidemic disease, as one of the saviours of society. "Partly by weeding out those of lowest development, and partly by subjecting those who remain to the never-ceasing discipline of experience, nature secures the growth of a race who shall both understand the conditions of existence, and be able to act up to them."[1] Again—"Mark how the diseased are dealt with. Consumptive patients, with lungs incompetent to perform the duties of lungs, people with assimilative organs that will not take up enough nutriment, people with defective hearts that break down under excitement of the circulation, people with any constitutional flaw preventing the due fulfilment of the conditions of life, are continually dying out, and leaving behind those fit for the climate, food, and habits to which they are born. Even the less imperfectly organised, who, under ordinary circumstances, can manage to live with comfort, are still the first to be carried off by epidemics; and only such as are robust enough to resist these —that is, only such as are tolerably well adapted to both the usual and incidental necessities of existence, remain. And thus is the race kept free from vitiation."[2] And thus we are introduced to "natural selection" and "the survival of the fittest." In "Social Statics" (p. 353 *et seq.*), we are desired to note how aged and infirm ruminants are killed and eaten by "their carnivorous enemies," and so the average happiness and well-being of both are promoted. In man, among other analogous processes, are specified "the beneficence which brings to early graves the children of diseased parents, and singles out the low-spirited, the intemperate, and the debilitated as the victims of an epidemic." In "The Man *versus* The State," written thirty-three years later, Mr. Spencer refers to Mr. Darwin's doctrine of "natural selection," promulgated in the interval, as strengthening his position, and expresses surprise that, despite the general acceptance of this doctrine by cultivated people, "now more than ever before in the history of the world, are they doing all they can to further survival of the unfittest."

---

[1] *Social Statics*, p. 430.

[2] *Social Statics*, p. 430.

In the first place, let us consider what is the comparative value of disease as a factor in natural selection in civilized man and in the lower animals? We must not think of disease, or rather its causes, merely as producing death, as we are apt to do when the elevation of the race by the extinction of the individual fills up our field of vision. Disease is not like the deer-stalker's bullet, when his aim has been true, and one falls while all the rest of the herd gallop away unharmed. It resembles the discharge of "buck-shot" or "sparrow hail," which scatters, and for every one killed there are a number maimed. Granting, then, that the most unfit dies, round every *deceased* unfit there are a number *surviving* more or less unfit, because of the effects of disease. This is the invariable result of the action of disease or disease-producing agencies on life. But in the lower animals the predatory instincts of one order promote the development of another by killing and devouring its weaklings, and within the order itself sexual selection tends to isolate the individual from posterity. In civilized man the weaklings survive, and sexual selection does not effectively prevail. The analogy is perfect between the effects, immediate and remote, of a cartridge fired at a large covey or a volley on the battlefield, and the comparative value of disease as a factor in natural selection in these cases. In the former there are the dead which are bagged by the sportsman, and the wounded who are eaten before nightfall by hawks, weasels, cats, &c.; in the latter there are the dead who are buried, and the wounded who are carried away and survive with various deformities and injuries. If you want full evolutional value out of disease in man, regarded merely as an animal, you must kill or seclude from society; but killing is murder, and sexual selection can only be promoted by the diffusion of knowledge and the elevation of morality to such a sublime pitch that the individual will limit his happiness, subdue his desires, and in short extinguish himself for the benefit of posterity. How far we are from this consummation no one has had a better opportunity of judging than Dr. Maudsley. Speaking of certain diseases having a strong hereditary tendency, he says:—"Those who, having fallen in love, are aware of the existence of them in their families, are, therefore, not a little troubled sometimes with scruples of conscience, and anxiously ask medical advice whether they shall marry or not. In the end they commonly marry, whatever the advice given them, having persuaded themselves that the epilepsy was not real epilepsy, but a form of strong hysteria; that the lung mischief was not constitutional phthisis, but the accidental consequence of a neglected cold; that the insanity was not the outcome of family degeneracy, but an incidental effect of a blow on the head, which was thought nothing of at the time. Would the earth ever have been peopled had cool reason been potent enough to quench the hot passion of love?"[1] On the whole, then, from these premises I conclude that, in existing circumstances, the most efficacious and direct method of promoting the survival of the fittest in civilized man is to prevent disease of all kinds by the removal of its causes. Indeed, Mr. Spencer's argument from natural selection really strikes, not at *prevention* of disease, but at all forms of artificial interference with the tendencies of disease which maintain in life sick, crippled, and, in general, physically or morally impaired and unsound individuals.

---

[1] *Social Statics*, p. 413.

[2] *Social Statics*, p. 414.

So much for disease in general; but different diseases present different sociological aspects. Some begin and end in the individual, and do not descend vertically or spread laterally as morbid entities. Their value in the process of natural selection is confined to the extinction or the weakening of the staying-power of the individual. They exercise no direct physical influence on existing individuals, and on posterity only by impairing reproductive power, or diminishing the viability or the chances of vigorous and healthy life in the product of such parents. Simple inflammations, such as pleurisy and pneumonia, are illustrations of this class. Other diseases descend, or tend to descend, vertically. They are distinctly hereditary—as epilepsy, insanity, gout. Others, again, are remarkable for lateral extension, from person to person, from town to town, from country to country. These do not descend vertically, and influence posterity only indirectly in the same ways as the first class. But they stand out as the most potent sociological disease factors in virtue of their power of lateral extension or infectivity. You have no doubt remarked how frequently Mr. Spencer brings in epidemics as his ministers in the discipline of mankind, and, though I propose to derive quite other lessons as to their influence, we cannot over-estimate their teleological importance. I cannot display this feature of infectious disease in more apt and impressive words than those used by Dr. Farr, who says :—" Diseases of this class distinguish one country from another—one year from another; they have formed epochs in chronology; and, as Niebuhr has shown, have influenced not only the fate of cities, such as Athens and Florence, but of empires; they decimate armies, disable fleets; they take the lives of criminals that Justice has not condemned; they redouble the dangers of crowded hospitals; they infest the habitations of the poor, and strike the artisan in his strength down from comfort into helpless poverty; they carry away the infant from its mother's breast, and the old men at the end of life; but their direst eruptions are excessively fatal to men in the prime and vigour of age." This last statement is not exactly in harmony with what you have heard of " sweeping away by pestilence tens of thousands of unhealthy livers," or " weeding out those of lowest development.". . . [Several paragraphs descriptive of the ravages of the major infectious diseases are here omitted.—(Ed.)]

---

[1] "Heredity in Health and Disease."—*Fortnightly Review*, May, 1886.

I have thus rapidly caused to pass in review before you the most important communicable diseases which infest mankind. They present interesting differences, but, speaking of them generally, I ask your attention to the following points :—

1. *The property of lateral extension*.—Given one person in a community attacked by communicable disease, and the one tends to become two, the two to become four; or it may be the one tends to become three, the three to become nine, and so

on. In all cases you have a tendency to geometrical progression, but the ratio will vary according to the intensity of the tendency in the special disease. This tendency carries the disease from its centre of origin, as the prairie fire licks up blade after blade of grass and leaps from tree to tree with an ever-widening front. Every sick person is a menace to those who are well. The settler does not awake to his danger when the careless match is thrown down among the dry grass miles away, but it began then, not when the lurid reflection of the gathering fire lights up the horizon.

2. *The habit of endemicity* or of lurking during the intervals between epidemics in places where the conditions are peculiarly favourable to the maintenance of the disease. It may be a house in a street, or a street in a district, or a district in a city, or some special area in a country, or some country in a continent. It may even be one special corner in the world; but in all cases it is the permanence and intensity in the lurking place of the conditions which sustain the disease in life, which lead to the settling down of the disease in this particular place. The interest of the houses, streets, districts, and countries which have never been visited by an epidemic, or have successfully expelled it, in these endemic centres is this—that a perpetual menace of re-invasion is thus kept up. It is the same interest which the lair of the tiger has for the inhabitants of the neighbouring villages; or which the Scandinavian fiords, whence the Norse men put out, had to the east coast of Scotland and England; or the seaports of North Africa, where lurked the Barbary pirates, to the seafarers of the Mediterranean and the English Channel.

3. *The artificial and therefore remediable nature of the local conditions which foster endemicity.*—Climate, soil, and other physical features may give those conditions greater efficiency and energy, but the conditions themselves are all essentially of the nature of uncleanliness, and at most the physical peculiarities only emphasize the necessity of cleanliness. Cholera, Yellow Fever, Enteric Fever, and Typhus all positively live upon gross and palpable dirt, and wherever they sustain themselves in the endemic condition there will that dirt be found most gross and most palpable, and from thence may they be exterminated by the removal of that dirt.

4. *Even those communicable diseases, such as Smallpox, Measles, Scarlet-fever, and Whooping-cough, which can scarcely be said to live upon uncleanliness, but attack man as man, are* ALL *aggravated thereby.* Their epidemic tendency is increased, their fatality heightened, their capacity for indiscriminate extension intensified.

5. *The soil which sustains the communicable disease in the*

endemic condition and promotes the epidemic expansion is the same which produces general unwholesomeness. A city or a country which is noted for epidemics, and which harbours communicable diseases as endemics, is always unhealthy. The measures which will exterminate the communicable diseases will promote general health by lessening the prevalence of non-communicable diseases. In short, the adoption of radical measures for preventing epidemics covers the whole field of sanitation. The wider result follows with certainty the enterprise undertaken with the narrower aim, and cannot otherwise be attained.

6. *Whoever persists in a manner of life calculated to produce or promote communicable disease injures himself first, but next, and with certainty, his neighbour.* The lawyer's question—"And who is my neighbour?" here rises involuntarily to our lips, and I know of no path which leads us to a wider answer to this old question than that which we have been following to-night. Who is the neighbour of the man living under the conditions of civilized life? Mr. Darwin by the same route reached this conclusion :—"Man is liable to receive from the lower animals, and to communicate to them, certain diseases, as hydrophobia, variola, the glanders, syphilis, cholera, herpes, &c.; and this fact proves the close similarity of their tissues and blood, both in minute structure and composition, far more plainly than does their comparison under the best microscope, or by the aid of the best chemical analysis."[1] Carlyle got a step higher through Dr. Alison's story of the "poor Irish widow," whose husband had died of typhus "in one of the lanes of Edinburgh," and who wandered about the town with her three children, seeking help, and finding none returned to her lane and died there, and set a-going a local epidemic which ended in the death of "seventeen other persons." He says :—"Very curious. The forlorn Irish widow applies to her fellow-creatures, as if saying, 'Behold, I am sinking, bare of help; ye must help me! I am your sister, bone of your bone, one God made us; ye must help me.' They answer, 'No, impossible; thou art no sister of ours.' But she proves her sisterhood; her typhus fever *kills* them: they actually were her brothers, though denying it! Had human creature ever to go lower for a proof?"[2] It certainly was low enough, but human nature requires such arguments, and the ultimate cause of the existence of communicability in disease is, I believe, to enforce the golden rule upon us in reference to the physical well-being of mankind. For "who is my neighbour" in this aspect? Not only is the Irishman in his miserable hut

---

[1] *Descent of Man*, 2nd edition, p. 7.

[2] *Past and Present*, Book III., chapter 2.

neighbour to Dives in Belgravia, but the Polish Jew in his filthy "quarter"; not only the unvaccinated children of Leicester, but the unvaccinated French Canadian; not only the poor man in the slums, but the Indian ryot, who washes in the village tank and casts his dead into the sacred stream; the Mahommedan pilgrim, who drinks at Mecca the waters of the sacred well of Zem-Zem, which the profane chemist tells us is polluted with sewage and a main factor in the dissemination of the cholera which he carries a long stage on its journey to Europe; and the fellahs of Egypt, and every inhabitant of every unsavoury town and village in Europe where the cholera encamps on its progress to Great Britain. Indeed, in these days rapid transport has so shrivelled up space, and commerce so intermingles and distributes articles of trade which may carry disease, that it is hard to say who in the wide world may not prove their affinity to me as forcibly as my next-door neighbour.

The practical question is—"What am I to do with my dirty neighbour?"—and we must bring to the solution of it a little common sense and ordinary business principles as well as philosophy. The first thing to be done is to make him a voting unit in some convenient area of local government. Let the boundary be fixed in populous places so that the whole continuous or contiguous inhabited area shall be one; in rural districts so that sufficient mental area shall be secured to swamp local indifference and sustain an adequate executive machinery. Let the rates for all local purposes be raised from the same area, or somehow make it possible for any intelligent ratepayer to balance his liabilities for poor rates, police rates, water rates, public health rates, and so on, from time to time, and so satisfy himself that it pays to be cleanly and healthy. Impose upon these local administrative bodies the duty of providing the physical conditions and appliances of health, such as water-supply, sewerage, drainage, epidemic hospitals, disinfecting apparatus, &c., and of carrying out the daily operations, such as scavenging and sanitary supervision, necessary to keep the district clean outside and inside the houses of the inhabitants. To provide against the contingency of my dirty neighbours having a local majority, as well as to maintain a staff of higher capacity to advise in special emergencies and hold local inquiries, let there be at the head of the sanitary administration of the country a local government board armed with power to enforce the performance of such duties as, being neglected, first injure the locality, but next involve a risk to the general well-being of the country. The local administrative must, of course, have parallel power of prosecuting and punishing the dirty neighbour for overcrowding and other nuisances which affect the well-being of the neighbourhood. The principle to be strictly followed both in the case of the personal and the local administrative unit must be not to do anything for them, but make them do it for themselves, and bear the expense as they will reap the benefits. In this way, a constant process of education would be carried on, and a sense of personal and local responsibility be maintained. Besides, every means of directly educating the dirty neighbour should be adopted. Let his children be taught in wholesome schools, where personal cleanliness and decency should be enforced during school hours; and let them have lessons in the rudimentary facts of hygiene, and the relation of disease to pauperism, crime, and taxation.

As a mere matter of business all this requires official administrative machinery. Every business man knows that if you really wish any function implying co-operation to be properly performed, there must be executive machinery, departmental sub-division, and general supreme supervision and co-ordination. Nothing is more conspicuous than the helplessness of the individual under the conditions of civilized life to secure the physical basis of health. What can one man wedged up in a crowd do to get fresh air, pure water, more standing room, or to avoid his neighbours' disease? It is a question of personal physics, not of personal morality. There must be co-operation, with the unavoidable concomitant of sacrifice of some individual liberty. To trust to voluntary association, without legal sanction which shall coerce the unwilling minority, who have the power to undo all that the majority are doing, soon works its own cure by a *reductio ad absurdum.* There will always be stupid or wicked people, who must be coerced not for their own sake but to save the wise. In America, although the locust plague was estimated to entail a loss of 200 millions of dollars per annum on the Union, no single farmer or even State could effectively combat the winged enemy. Congress appointed an Entomological Commission who drew up a scheme of national co-operation against the national plague, but they had also to take account of the dirty neighbour, and call for "State legislation to compel the indifferent and slovenly members of each community to co-operate with their more careful neighbours in carrying out precautionary measures for the destruction of locust eggs or newly-hatched insects."[1] The same has been our experience in Cyprus in combating the same insect. Purely voluntary co-operation failed. The apathetic peasants sometimes would not protect their own crop, to which no one would have objected if they could have starved alone.

---

[1] *Nineteenth Century*, January, 1885. "Locusts and the Farmers of America." Miss Gordon Cumming.

The solidarity of human interest in the face of communicable disease has in recent times asserted itself far beyond the submerging of the individual. Nations are now learning that organization, to be equal to the task of successfully resisting the inroads of such diseases as cholera, yellow fever, and small-pox, must embrace not only local authorities within nations, but nations themselves. Even the United States, with all its jealousy of central interference with the doings of individual States, learned from the ravages of yellow fever in the Mississippi valley in 1878 that some general co-ordination and direction was necessary for the national good, and hence the Act establishing a National Board of Health passed by Congress in the following year. Canada felt that she, being in territorial continuity, could not stand aloof, and, although as yet without legislative interference, the officials of the two countries have by conferences come to an understanding as to interchange of information and mutual assistance against the common enemies of their health and life. In Europe the same powerful agency has brought governments into negotiation. "Cholera conferences" between representatives appointed by the various governments have been held. Great Britain, under whose rule the habitats of cholera exist, has been made to feel her responsibility to all Europe. At the International Sanitary Congress which recently met in Vienna, a resolution was adopted to the effect "that an international convention between the different States be established against cholera, plague, and other communicable diseases." Certain principles were accepted as the basis of this international co-operation, among which were not merely compulsory notification of each case, concentration of intelligence of new movements of disease in a central Board sitting in some neutral State, and redistribution therefrom of disease-warnings, rules as to commerce, passengers, inspection, disinfection, &c., but stipulations as to water-supply, drainage, and other measures for the prevention of disease at its point of origin. In this way, step by step, the final end of the existence of communicable disease is being worked out. Self-interest enlists the most enlightened nations in the promotion of the physical welfare of the poorest and most wretched inhabitants of the remotest corners of the earth.

SANITATION AND SOCIAL ECONOMICS: AN OBJECT LESSON.[1]

At next meeting I shall leave this chair and the elevated position which, by your favour, I have occupied for three years. It is a usage of this Society, the wisdom of which my successor will no doubt fully recognise, to require the retiring President to introduce the Session with an Address. You will see from the subject of this Address, as announced in the billet, that I am not going to lead you into " fresh fields and pastures new." I hope, however, you will think it not altogether unnatural or inexcusable, on my part, to seize this last opportunity of obtaining for an old cause the attention which the eminence of the chair of the Philosophical Society of Glasgow always commands.

---

[1] President's Address at opening of 87th Session of Glasgow Philosophical Society, 6th November, 1889.

In a Report on " The Vital Statistics of the City of Glasgow," published in 1886, in which I described *seriatim* the districts into which the city is divided for statistical purposes, specifying the main physical features of each in relation to the health of its inhabitants, you will find the following with reference to—

" DISTRICT 14, or '*Bridgegate and Wynds.*'

	1871.	1881.
Population,	14,294	7,798
Acreage,	35	35
Density,	408	223
Mean number of rooms per house,		1·855
Do. persons per room,		2·946

(1880) Percentage of houses of 1 room, 49 ; 2 rooms, 35 ;
5 rooms and upwards, 1.
Percentage of Irish-born, 32.

DEATH-RATE.

All ages—mean,	1871-2,	42·3 ;	1880-1-2,	38·3
Under five years—mean,	„	166·1 ;	„	138·7

MEAN, 1880-1-2.

Birth-rate,	37·1

DEATH-RATE.

Under 1 year, per 1,000 born,		206
All ages from Infectious Diseases,		4·15
Do. Consumption,	5·28	16·75
Do. Acute Diseases of Lungs,	11·47	

Percentage of Total Births, Illegitimate, 22.
Do. Total Deaths, Uncertified, 25.
Do. Do., Insured, 32.

" District 14, or '*Bridgegate and Wynds,*' bears a sufficiently descriptive designation. It lies between Stockwell Street and Saltmarket on the west and east, and Trongate and Clyde on the north and south. The Union Railway occupies the very centre. Between the clearances necessary to its formation and the operations of the Improvement Trust, this District has been, so to speak, disembowelled. Still, in those portions which remain, we find a population the like of which, for social and moral degradation, is not to be found in the City. Their houses, though much has been done for them, are radically bad, and total demolition and reconstruction is the only remedy. To enumerate those plague spots would simply mean to catalogue all the wynds, narrow, noisome streets and closes of this unhappy area, and to bring once more into public notice names which have been the heartbreak of successive generations of Glasgow philanthropists.

"We began this survey of the districts of Glasgow with 'Blythswood,' which was remarkable as having the lowest proportion of inmates per inhabited room, the largest proportion of large-sized houses, the lowest death-rate, the lowest birth-rate, the lowest mortality under five years, the lowest proportion of deaths under 1 year per 1,000 born, and the lowest proportion of Irish-born. We end it with the 'Bridgegate and Wynds,' which has the largest proportion of inmates per inhabited room, the largest proportion, save one, of 1-apartment houses, the highest death-rate over all, the highest death-rate under 5 years, the largest proportion of deaths under 1 year per 1,000 born, and the highest percentage of Irish-born inhabitants."

It is this district which I propose to take as an Object Lesson on the relation between Sanitation and Social Economics. I quote this passage to satisfy you that, although I shall confine the details of this Object Lesson to the year 1888, I select District 14, not merely because in this single year it was the worst district in Glasgow in all sanitary and social aspects, but because it has *always* occupied this unenviable position. Further, I make the *worst* district in Glasgow my Object Lesson, because there we find in their greatest intensity the physical conditions and the associated vital and social characteristics which determine the position of every other district in Glasgow in the sanitary scale. The difference in the causes which produce the different results is a difference in degree, not in kind.

Speaking to a Glasgow audience it is unnecessary to spend much time over the location or the physical features and conditions of District 14. I repeat that it is to 1888 that my statements refer. The district embraces an area of 35 acres, in which there are 1308 houses, inhabited by 7150 persons. This is .57 per cent. of the total area inhabited by 1.29 per cent. of the total population of the City. The healthiest district of Glasgow, "Kelvinhaugh and Sandyford," or District 17, embraces 10.24 per cent. of the area, and is inhabited by 5.62 per cent. of the population.

The character of the house accommodation and the physical conditions generally are sufficiently described in the passage quoted. I shall only add that 51 per cent. of the houses are "ticketed," and thus subjected to the system of night inspection for the prevention of overcrowding, described in my address last year. In "High Street and Closes (E.)" (District 6), there are 55 per cent., and in "Cowcaddens" (District 16) 57 per cent. of such houses, while in "Kelvinhaugh and Sandyford" (District 17) there are only 1.4 per cent. District 14 also contains 43 of the total 99 Common Lodging-houses in the City.

There were 232 *deaths* and 218 *births*, so that this district produced 14 fewer lives than it consumed. District 17 had 431 deaths against 811 births, thus contributing a surplus of 380 lives; while the whole city had a surplus of 7722 lives. Reduced to rates per 1000 of the population, these figures represent for District 14 a birth-rate of 30.49, a death-rate of 32.45; for District 17 a birth-rate of 26.14, a death-rate of 13.89; for the City a birth-rate of 34.92, a death-rate of 20.91. The infantile death-rate when calculated per 1000 born is of more value as a gauge of health than the general death-rate, especially seven years after the census, because the data are unquestionable. In District 14 the death-rate of children under 1 year of age was 239 per 1000 born; in District 17 it was only 88, and in the City 133. This means that in these districts and in the City 24 per cent., 9 per cent., and 13 per cent. of the children born did not survive their first birth-day.

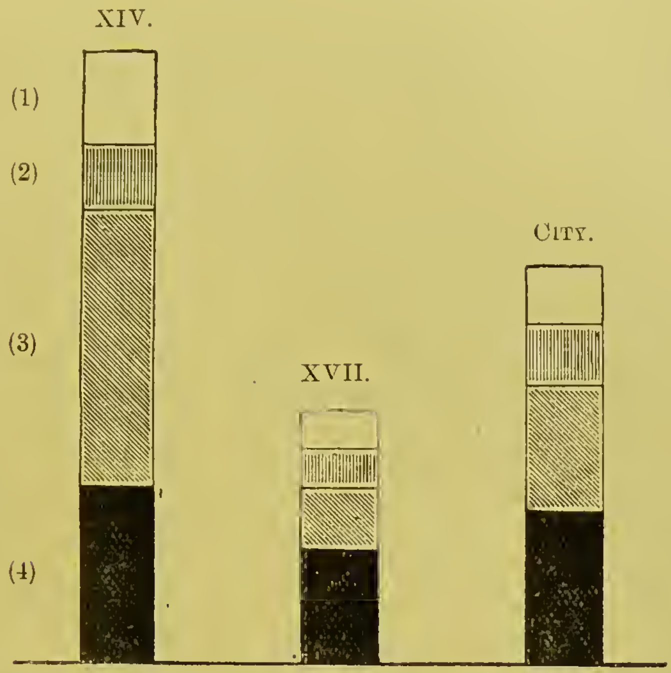
Illegitimacy introduces us to the morality of the district. In District 14, 25 per cent. of the children were born out of wedlock, in District 17 only 3 per cent., and in the City 8 per cent. No district approaches District 14 in illegitimacy: 1.29 per cent. of the population contributes 3.7 per cent. of the illegitimate, and not 1 per cent. of the legitimate births in the City.

In the following table the *comparative mortality* from Zymotic or Infectious Diseases, from Diseases of the Lungs, and from Nervous Diseases and Diseases of Nutrition in Children, in Districts 14, 17, and in the City is exhibited in death-rates per 1000:—

	XIV.	XVII.	City.
Zymotic Diseases (including Diarrhœa), -	4·76	1·67	2·84
Nervous Diseases and Diseases of Nutrition in Children, - - - - - -	3·36	1·84	3·00
Acute Diseases of the Lungs and Consumption, - - - - - - - -	14·68	3·93	7·00
Miscellaneous Unclassified Diseases, - -	9·65	6·45	8·07
	32·45	13·89	20·91

These death-rates are shown in a diagram, in which the columns are on the same scale, so that your eyes can estimate not only the comparative total mortality, but also the comparative fatality of the classes of disease. It is obvious that Infectious Diseases and Diseases of the Lungs are the two scourges of District 14. The death-rate from Diseases of the Lungs *alone* is greater than the death-rate from all causes in District 17. The comparative loss of life among children is not sufficiently shown from contrasting the death-rates on the basis of the whole population: the proportion of children living below five years being so small in District

14. If we take the deaths from Debility owing to Premature Birth, and represent them in rates per 1000 born, we not only get a better gauge of the deadly influences to which children are subjected after birth, but we also discover that they extend into intra-uterine life. In District 14, 41 per 1000 of the children born died because they were born prematurely; in District 17 only 12, and in the City 17.5 per 1000.



(1) Zymotic Diseases. (2) Nervous and other Diseases special to Children. (3) Diseases of the Lungs. (4) Miscellaneous.

The matter of *Certification* throws some light on the care bestowed upon the sick. If the cause of death is duly certified to the Registrar the person who died must have received some amount of attention. On the other hand, if it is not certified there must have been neglect, and for every such uncared-for death-bed there must have been many uncared-for sick-beds. In District 14, 18.5 per cent. of all the deaths were not certified, in District 17 only 3 per cent., and in the City 5.7 per cent. In some of these cases a medical man was alleged to have seen the patient, but was unable to certify, from lapse of time or from being unable to identify the person. In the majority of cases in District 14 there was no medical attendant. Absolutely no medical man had seen the deceased during their last illness. This was alleged to the Registrar in 15.5 per cent. of the fatal sicknesses in District 14, not in 1 per cent. in District 17, and in 3 per cent. in the City.

The proportion of the deaths in a district in which the deceased was *enrolled in a Friendly Society* gives us a fair indication of the extent to which the virtue of providence or foresight prevails in that district. In District 14, 40 per cent. of those who died were members of Friendly Societies, as compared with 45 per cent. in District 17, and 56 per cent. in the City as a whole. But we must turn to the good working-class districts for a proper comparison. In the District of "Greenhead and London Road" 65 per cent. of the deceased were members of Friendly Societies, in "St. Rollox" District 67 per cent., and in the District of "Springburn" 70 per cent.—the highest in the city. It is quite evident from these figures that the inhabitants of District 14 are not distinguished for providence.

We come now to the *Social Economics* of District 14. What does the existence of this unhealthy area mean to the community of which its inhabitants form a part? *Sickness* in our own families we know means expense. On whom does the cost of treatment fall in their case? We can only get at a partial answer to this question, and in an indirect way, by observing where the fatal cases of sickness were treated. There were 232 deaths. Of these we have seen that 43, or 18.5 per cent., were uncertified, and therefore received no useful, or what can in any sense be considered satisfactory, medical care in their last illness. I find that 69, or 29.7 per cent., died in public institutions, and 120, or 51.8 per cent., died at home, and the cause of their death was duly certified. We may classify the institutions into those supported by public rates and those supported by charity. The distribution of the deaths among the rate-supported institutions was the following:—In the City Poorhouse, 47; in Belvidere Fever Hospital, 10; in the North Prison, 1; in the Central Police Office, 1;—so that the cost of treating those 59 fatal cases of sickness, or 25.4 per cent. of the whole, was defrayed out of public rates. The distribution of the deaths among charitable institutions was as follows:—In the Royal Infirmary, 6; in the Western Infirmary, 3; and in the Maternity Hospital, 1;—so that the cost of treating those 10 cases, or 4.3 per cent. of the whole, was defrayed from the free contributions of the charitable. As I explained to you last year, there are very many deaths which take place, especially in Poorhouses, of persons who have been so long resident therein that they cannot be referred to any special address in the city, though they all came from the poor quarters. These deaths remain against the institutions as unallocated. There were 328 such in Glasgow institutions in 1888, and an unknown proportion doubtless originally came from District 14. There are other circumstances which go to prove that 30 per cent. by no means represents either the proportion of the total sickness or the total deaths in this district, which entailed expense upon the public, both as ratepayers and as contributors to such charities as hospitals, dispensaries, nursing associations, and the like. The probability is that very little medical aid is obtained in this district except what the public pay for, or the profession bestow for nothing. The proportion of all the deaths in the City which took place in institutions of all kinds was 15.5 per cent.

The cost of *interment* is a very definite and unavoidable item in the general expenditure which accompanies disease. I find that 86 of the persons who died in District 14 were interred at the expense of the ratepayers, or 37 per cent. of the total. Of these, 49 were interred by the Parochial Board, and 37 by the Sanitary Department, as Local Authority under the Public Health Act. This is exclusive of 10 still-born children, also interred by the Sanitary Department, a suggestive item in the sum of wasted life which is recorded against this unhappy district. No less than 22 per cent. of all the interments, the expense of which was defrayed by the Sanitary Department in 1888, were of children still-born in this and other similar districts in the city. Of those who died in the whole City 9.28 per cent. were interred at the public cost.

Expense attends our entrance upon life as well as our exit from it. Of the *children born* in District 14, 15 were born in the Maternity Hospital and 6 in the City Poorhouse—21 children who began their lives at the cost of charity and the rates, or 10 per cent. of the total births credited to the District; and 21 mothers maintained and provided for. A much larger number of women received the minor benefaction of attendance at their own houses by the doctors and nurses of the Maternity Hospital. The births of 98 children were so attended, or 45 per cent. of the total; so that at least 55 per cent. of the children of District 14 made their début in the tragedy of their lives by the help of charity or the rates, as compared with 25 per cent. in the whole City (3 per cent. in hospital and 22 per cent. attended at home).

Vaccination is another item of expenditure necessary to be incurred on behalf of every child born who does not die before the six months allowed by law have elapsed. A large proportion of the children of District 14 do so die, and between the Sanitary Department (86), and the Royal Infirmary (21), and the Parochial Vaccinators (?), the vaccination of the remainder is effected—another service defrayed by the ratepayers and the charitable. Approximately, 50 per cent. are thus vaccinated as compared with 25 per cent. in the whole City.

The extent of the *demands made upon the services of the Sanitary Department* by the several districts of Glasgow is clearly shown in the Sanitary Inspector's Annual Reports. If we take various forms of personal work done by officials within the bounds of this small area we shall get some conception of the amount of public money expended on it merely in the shape of the time of subordinate officers :—

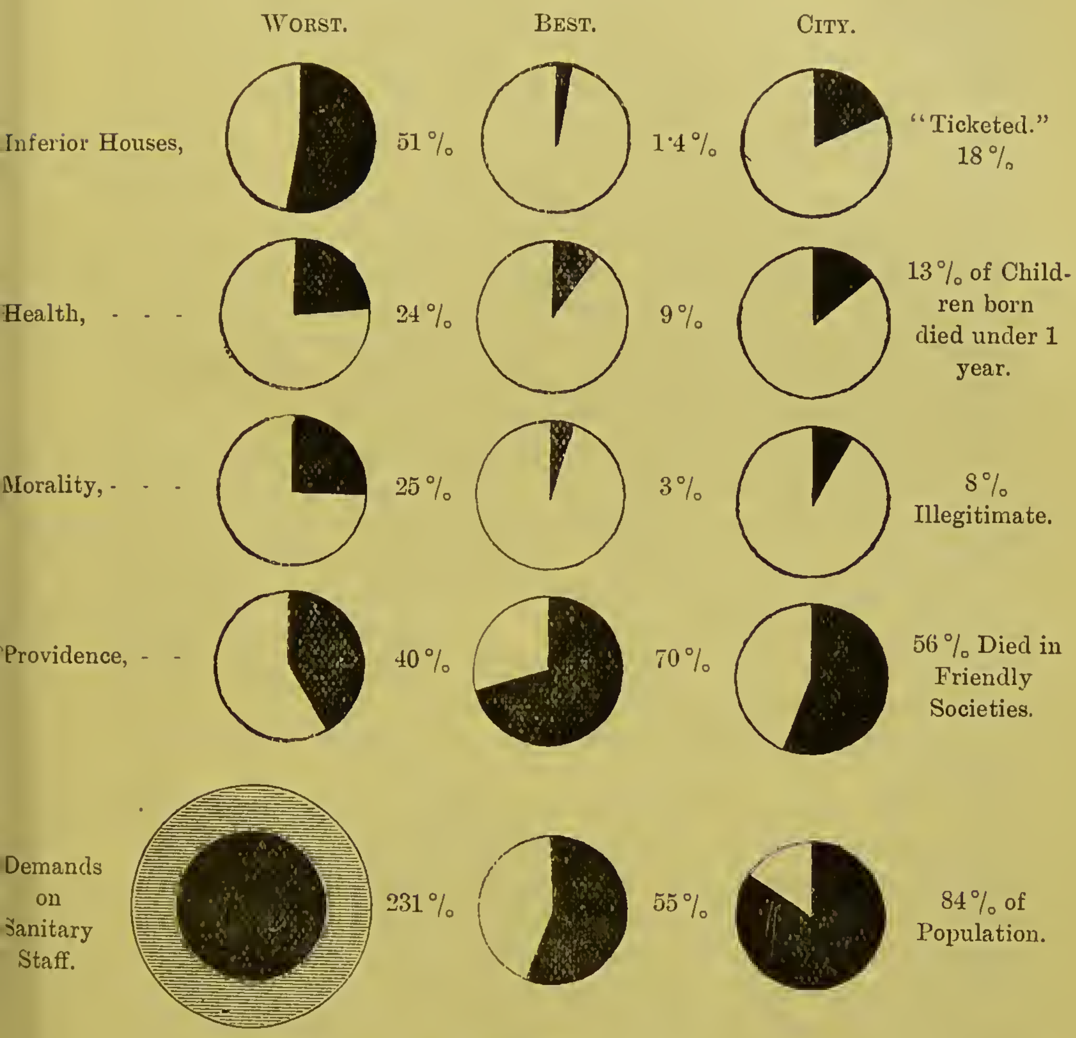
Inspections of Nuisance and Epidemic Inspectors,	7,104
Searches after Vaccination Defaulters,	62
Applications of the Smoke Test to drains,	17
Inspections of Common Lodging-Houses,	3,002
Do. Houses Let in Lodgings,	108
Night Inspections of Ticketed Houses,	2,620
House Visitations by Female Inspectors,	3,616
	16,529

—being a grand total of 16,529 individual expenditures of official time within the district, or 231 per hundred of the population. In District 17 the same services amounted only to 53 per hundred of the population, and in the City to 84. Behind all this personal service within the district follows a proportionate amount of office work, of expenditure for the removal of nuisances, of work in police and other courts, of outlay in treating infectious disease, in cleansing and disinfecting houses and clothing, and otherwise in carrying out miscellaneous sanitary operations. The nuisances discovered amounted to 38 per hundred inhabited houses in District 14, as contrasted with 15 in District 17, and 16 in the City as a whole.

I cannot present you with a similar precise comparative statement of the *demands made upon the official time of the other public departments*, but I fancy the review of the long procession of statistical details which I have made to pass before you has convinced you that these demands must be in somewhat the same excessive proportion as compared with the other districts of the city as in the case of the Sanitary Department. There is the Police Department. Notwithstanding the undoubted improvement of the past 20 years, District 14 is still the Alsatia of Glasgow. It is still the headquarters of those who live in open defiance of the law. I have the authority of the Captain of Police for saying that it furnishes the greater part of the work of the Central Police Court. It would be safer to fall asleep at the foot of a tree in Central Africa than at the foot of a lamp-post in the Bridgegate. One has only to walk through it and observe how in the day time, when in a normal working-class district only children are seen in the streets, there every close has its knot of idlers; and to enter the houses where only mothers are to be seen elsewhere and find men and women sleeping by day in preparation for the dismal work of the night, to understand how freely the police rate is expended in or because of District 14. The Cleansing Department is largely occupied in sweeping-up and removing filth which is thrown over the windows and deposited

GLASGOW, 1888.

VITAL STATISTICS AND SANITARY DEMANDS OF DISTRICTS XIV. (*Worst*), XVII. (*Best*), AND CITY.



N.B.—Demands on Police, Cleansing, Parochial, and School Board services in like proportion.

about the courts. There are men employed doing nothing else but going round these courts and closes every few hours throughout the day with brush and hose and water-pail, and yet they are never clean. It is but fair to the inhabitants to add that these bad habits are encouraged, if not caused, by the abominable privy system. There are only 105 W.C.'s in the whole district. Just as the officers of the

Sanitary Department have to hunt for vaccination defaulters there, so have the School Board officers to concuss parents and follow up children. The Parochial officers also are never out of this district. It sends large contingents to Industrial Schools, Reformatories, Day-feeding Schools, Orphan Homes, and the like. It surrounds the Free Breakfast Table with its hungry crowds. It scours the West-End with its beggars, and is, in short, in words which I used many years ago, "a sort of running sore upon the body of the community, diverting its substance from healthy uses, and draining the lifeblood of the public."

So far, I have been giving you the various items on the debit side of the social account of District 14. Let us turn now to the credit side, in so far as it can be shown from *the payment of rates*. For the purposes of my argument it is necessary that I should remind you of the incidence of municipal taxation in Glasgow, which is, as regards the rates which are chiefly affected by the characteristics of District 14, I believe peculiar to Glasgow; and the effect of this peculiarity of incidence is to make my argument more weighty as applied to Glasgow than to any other city in the kingdom.

(1) Occupiers at rents of £4 and under are assessed for no municipal rates whatever. The owner is liable for Police, Statute Labour, and Sanitary Assessments (Local Act), under a deduction of 25 per cent. He is further liable for the Roads and Bridges and Public Health Assessments on the same class of property without deduction. No assessment is made on such rentals for City Improvement, Parks and Galleries, or any other municipal purpose.

(2) All rents are assessed at a uniform rate for Statute Labour.

(3) All rents below £10 are assessed for the Police Rate proper (for Police, Cleansing, Lighting, Fire Brigade, Baths and Wash-houses, &c.), and the Sanitary Rate (Local Act), at half rates; that is to say, at £10 and upwards the rate per £1 is twice the rate below £10 (including £4 and under), and above £4 the whole assessment is raised from occupiers.

(4) There are other rates, such as for Municipal Buildings, Registration of Births, &c., Lunacy and Prison Payment, which are assessed half from owners, half from occupiers, the owners' half being charged on rentals at £4 and upwards, and the occupiers' half on rentals above £4; while the Juvenile Delinquency rate is also levied on rentals above £4, but wholly from occupiers.

(5) A special rate for the cleansing of private streets and courts is levied upon their proprietors.

It is evident from this peculiar local arrangement of the incidence of taxation that the occupiers of subjects rented at £10 and upwards are, in respect of the cost of Police, Cleansing, and Sanitation generally in Glasgow, burdened by law with a disproportionate share of the outlay created by the lower-rented occupiers, who are notoriously the class who make the heaviest demands on the rates for these purposes. Therefore, supposing everybody paid his or her legal share of this taxation, it would still be true that the householders of such a district as 14 do not contribute, on the basis of rental, an equal share of the cost of these public services which they require so much in excess of the householders of other districts. The case is much the same as would exist if the owners of property in which fire-risks were excessive were required to pay a lower premium for fire insurance than the owners of property in which fire-risks were very slight. Still, if such was the law, and the low premiums and low rates were duly paid, no moral blame would attach to those who held property or occupied houses under such fortunate conditions. But the situation is very different in the case of the police rate. Those who are rated on rentals under £10 and above £4, are conspicuously the worst payers. I find appended to last Annual Financial Statement of the Magistrates and Council of Glasgow (Police) a table showing for a series of years the "number of persons assessed, paid and unpaid." In 1888-89 there were 55,773 occupiers assessed at the full rate, of whom only 963, or 1.7 per cent., did not pay; while there were 75,520 occupiers assessed at the half-rate, of whom 15,453, or 20.46 per cent., did not pay. Under occupiers are included not merely householders, but occupiers of all subjects at the respective rentals; but the defaulters are almost invariably householders, and therefore the percentages give a comparison rather unfavourable than otherwise to the occupants of houses rented at £10 and above £4.

It is evident, therefore, that in Glasgow, beyond all other cities, the high-rated householder and large ratepayer of all denominations have good reasons for looking narrowly into the economics of the low-rated householder. Part of his rateable burden is put upon the broad back of the larger tenant-ratepayer by law, and he seems to do what he can to impose the rest by default. If we take the number of householders alone at £10 and upwards, and reckon every defaulter who occupies a subject at that rental to have been a householder, we find 963 defaulters to 36,212 householders, or 2.6 per cent., as compared with 20.46 per cent., of the lower-rented and half-rated householders.

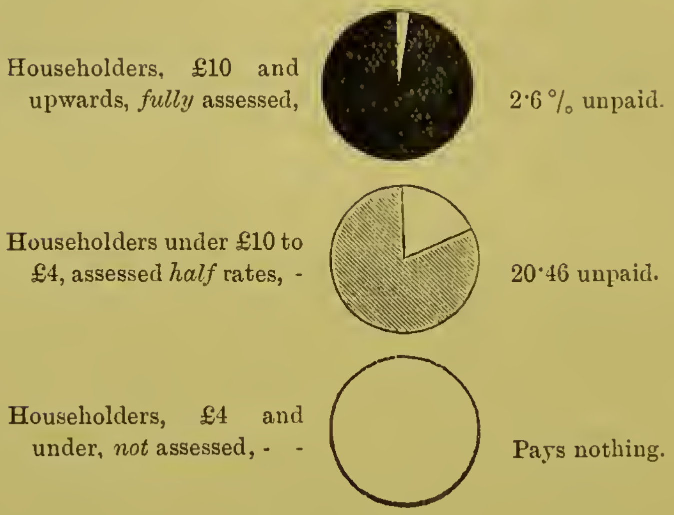
Poor rates and school rates are levied on £80 per cent. of all rentals, half on owner and half on occupier. The whole amount of the owners' rates is recovered, but again, in the case of the occupiers, a large proportion of the legitimate burden of the lower-rented householder is by default imposed upon the other ratepayers. From the fact that political disfranchisement ensues upon non-payment of poor rates by householders under £10 rental, the Collectors of the several parishes are required to report the defaulters annually to the City Assessor. In 1888-89, he informs me, there were 24,627 householders under £10 who were so reported. From the same source I learn that there were 86,491 houses under £10 (*including unoccupied*), so that at least 28.5 per cent. of the householders under £10 paid no poor rates or school rates.

GLASGOW, 1888.

INCIDENCE OF TAXATION AND PAYMENT OF RATES.

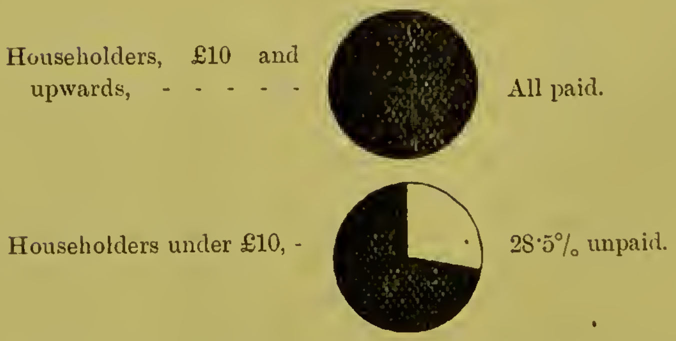
I.—*POLICE RATES.*

(Graded Assessment.)



II.—*POOR AND SCHOOL RATES.*

(Uniform Assessment.)



From the political results of non-payment of poor rates, from the fact that their collection is probably more stringent than that of any other rate, and from the uniformity of their incidence on every rental, I believe we may take the number of householders who pay no poor or school rates as a fair census of those who contribute nothing to the rates of Glasgow. A confirmation of this is obtained by the curious agreement of the figures reached by three distinct paths :—

1. Householders under £10 reported under the Registration Act as having failed to pay Poor Rates,		24,627
2. Occupiers under £10 and above £4 who failed to pay Police Rates,	15,453	
Occupiers £4 and under who pay no Police Rates,	8,559	
		24,012
3. No. of Ticketed Houses in Glasgow,		23,288

These figures can leave no doubt on any one's mind that we are practically dealing with the same persons all through, and I think we may safely state the number of householders in Glasgow who put nothing into the public purse, while they take freely out of it, at 24,000; which represents, at the moderate allowance of 3.5 persons per household, 84,000 souls. I find from returns furnished by the Collector of the City Parish that 20 per cent. of those who did not pay in that parish were relieved on account of poverty. A return prepared by the Treasurer of Police in 1884 showed precisely the same percentage of relief extended to poor persons—another coincidence which shows that we have the same persons in both categories. Therefore we may divide our 24,000 into 4800 relieved by the authorities, and 19,200 who relieved themselves; or, to be generous, let us say 5000 honest poor and 19,000 fraudulent householders!

Now, where are we to look for these householders? To get at the facts regarding all the householders in District 14 was a task which I could not ask my willings friends, Mr. Henry, the City Assessor, Mr. Reid, the Collector of Police Rates for the Central District, and Mr. Hall, the Collector for the City Parish, to undertake, though I believe they would not have refused me, so interested were they in my inquiry. What I did was this. I obtained from Mr. Henry a copy of the Valuation Roll of two of the worst localities in the district. I gave it to the two Collectors and asked them to tell me the result of their collection for 1888-89 as regarded the householders. I submit their statement :—

St. Margaret's Place Block—the area bounded by the Bridgegate and Jail Square, Saltmarket, and Market Street.

A recent special census showed that 665 persons resided in this block, and in the seven years, 1882-88, the mean general death-rate was 50 per 1000, and the death-rate under one year, per 1000 born, 234. There are four public-houses in this block, the rental of which is £295, and seven shops for the sale of food-stuffs, the rental of which is £136 15s.

1. *Municipal Rates so far as payable by householders.*—Number of householders rated direct, 116. The total amount of assessment due by them was £42 4s. 4d. Of these, 50 paid, the amount recovered being £19 12s. 3d.; 66 did not pay, the amount lost being £22 12s. 1d. That is to say, 57 per cent. paid nothing, and £53 10s. 10d. per cent. of the municipal assessments due by householders was lost.

2. *Poor Rates and School Rates.*—There are 147 householders, including three houses and shops, of whom 82, or 56 per cent., paid nothing. The amount of poor rates due was £18 9s. 6d., the amount paid was £10 17s. 1d. The amount of school rate was £12 4s. 2d., the amount paid was £7 3s. 5½d.

118½ BRIDGEGATE—two tenements which, in January, 1888, were ascertained to have 116 inhabitants. In the seven years, 1882-88, the mean general death-rate was 56 per 1000, and the death-rate under 1 year 379 per 1000 born. This block contains one public-house, the rental of which contributes 28 per cent. of the total rental of occupied premises, according to the Valuation Roll.

1. *Municipal Rates payable by householders.*—Number of householders rated direct, 20; amount of assessment due, £8 0s. 9d., *none* of which was paid.

2. *Poor Rates and School Rates.*—There are 23 householders (including one house and shop), of whom 15, or 65 per cent., paid nothing. The amount of poor rates due was £2 6s. 2½d.; the amount paid was 18s. 3½d. The amount of school rates due was £1 10s. 6½d.; the amount paid was 10s. 10d.

It is interesting to note how the Gas and Water Trusts cover the risks of doing business with this class of the population. The Gas Trust is protected by having the power to insist upon a deposit as a security before gas is supplied. The consequence is that a considerable proportion of the low-rented tenants, especially those rented at £4 and under, use no gas at all, but are contented with paraffin lamps. The landlord is responsible for all water rates on rentals under £10. The history of the deduction allowed by successive Water Acts tells its own tale. In 1855 the landlord was allowed 10 per cent. all round. On representations of their losses, in 1865 this deduction was raised and graded; on rentals under £10 to £7 the landlord was allowed 15 per cent. off, below £7, 20 per cent. In 1885 the reduction below £7 was further raised to 25 per cent. So that the people who pay no police or poor rates endeavour so far as they can to obtain water, one of the primary necessaries of life, at the cost of the community.

The last bit of information I shall give you regarding District 14 is a return with which the City Assessor has favoured me of the rental of licensed premises as compared with the rental of premises where food alone is sold, within this district :—

1. LICENSED PREMISES.

No.	Kind of Premises.	Rental.
43	Public-Houses, - - - - -	£5,167 2 0

2. PREMISES WHERE FOOD SUPPLY IS OBTAINED.

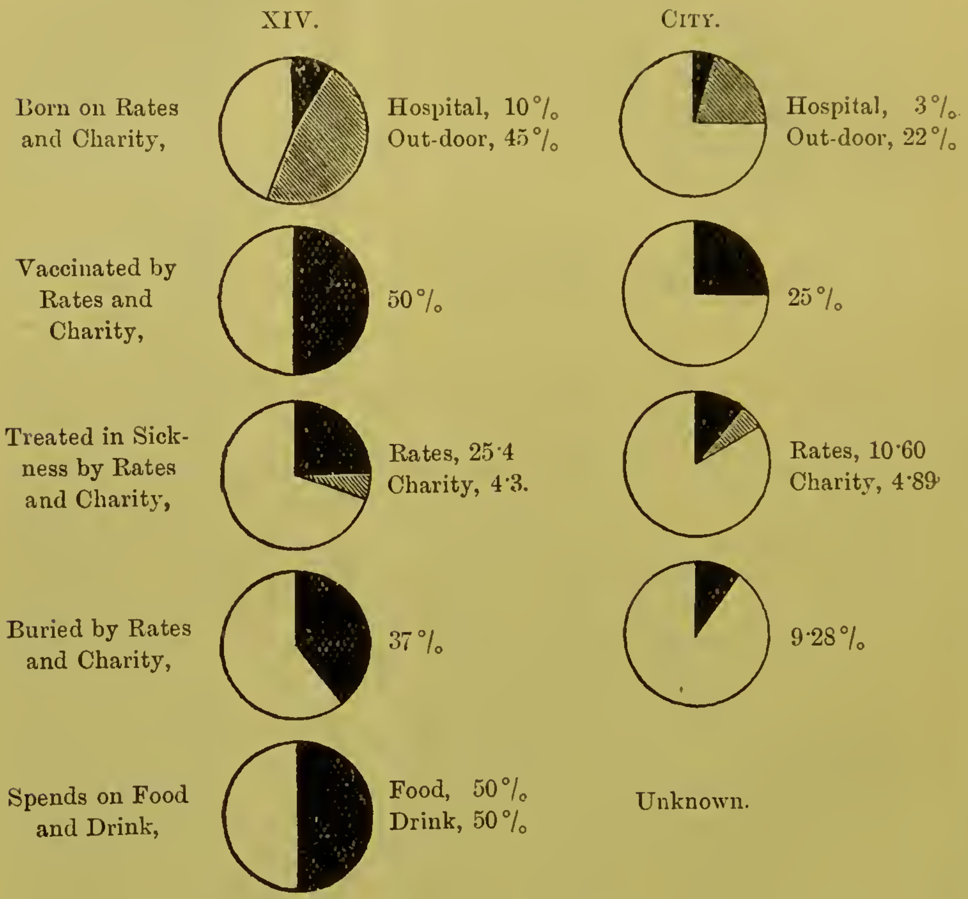
No.	Kind of Premises.	Rental.
43	Unlicensed Grocers, - - -	£1,363 12 0
1	Greengrocer, - - - - -	16 0 0
4	Bakers, - - - - - -	95 0 0
4	Dairies, - - - - - -	86 0 0
11	Confectioners, - - - - -	222 0 0
4	Miscellaneous, - - - - -	44 0 0
20	Restaurants, - - - - -	1,436 10 0
6	Butchers, - - - - - -	259 10 0
7	Fishmongers, - - - - -	257 0 0
3	Lodging-Houses (selling food), - -	165 0 0
1	Fish Market, - - - - -	1,000 0 0
	Total, - - - -	£4,944 12 0

The rental of public-houses in District 14 is £5167, and of premises where food of various kinds is sold without "drink" £4944. It may be said that the whole of the south side of Trongate is included in this district, and that in a great public thoroughfare in the centre of the city the public-houses supply the wants of passengers rather than of the residents. This is true, but it will be observed that £1000 is thrown in on the other side, the valuation of the public Fish Market, which is the centre of the wholesale fish trade, not of the city merely, but of its suburbs. Besides, the temperance restaurants, which are so numerous, and even the unlicensed grocers, share in the business of passengers as well as public-houses. On the whole, therefore, the return must be held to shed useful light on the comparative place of necessary food and the luxury of drink in the life of the locality. District 14 seems to spend as much on the one as the other. I think, as honest business men, apart from all views as to total abstinence or the association of crime, immorality, and disease with excess in the use of alcohol, you will agree with me in thinking that people who do not pay their rates, who throw themselves on the legal and charitable resources of the public in their sickness, their birth, death, and burial, simply take from the pockets of the public every sixpence which they spend upon drink.

Now, gentlemen, all the facts of the case of District 14 are before you. I told you at the outset that I selected this district for an object-lesson, because there we had in their greatest intensity the same kind of insanitary conditions associated with disease, death, crime, pauperism, neglect of social obligations, as you find in all the unhealthy areas and tenements of the city. Wherever you find those insanitary conditions you may foretell that a similar investigation will disclose in proportioned degree the same associated social characteristics. There you find a people unhealthy, reckless, spendthrift of their own and the public money, contributing little or nothing to the public purse, tinged more or less with immorality and crime. Guided simply by the abnormal death-rates, I could take you to the districts and tenements in which the main body of those 24,000 householders lives—in High

GLASGOW, 1888.

COMPARATIVE DEMANDS ON RATES AND CHARITY OF DISTRICT XIV. AND CITY.



Street and its closes, in Calton, in Cowcaddens, in Gorbals, and in small colonies chiefly in "back lands" dotted here and there over the city. Supposing you had them all transported in their more or less unwholesome tenements to some distant plain, you would then have a city larger than Greenock, and what a city!—certainly not the "new Jerusalem which cometh down out of heaven." Supposing you were told that you must pay all the rates of this parasitic city, pave and sewer its streets, light it, cleanse it, watch it, build and maintain prisons for its inhabitants, pay for attendance at their birth, build hospitals for them, treat their sick, bury their dead, educate their children—would you not at sight of the multitude, and in view of the solid mass of obligations to be imposed upon you, begin seriously to think what you could do to get rid of them? Would not the vision of that dismal shadow of your city haunt your dreams? Should we not have fierce orators storming through the municipal wards protesting against Communism and Socialism? Yet these people are living all up and down the city, and you are now bearing the full burden of these obligations. You cannot get rid of it while such places and such people exist. No thought among the many which this inquiry has called up in my mind has so deeply been impressed upon me as the various, often circuitous, but always certain, paths by which, as society is now constituted, these people requisition your material resources. They cling to you as the garment steeped in the poisoned blood of Nessus clung to and consumed the living body of Hercules. If you will not pay in the shape of improvement rates for the removal and reconstruction of their unwholesome dwellings, you must not only pay *their* rates but expend *your* rates upon them. If you object to pay for the prevention of their disease, you must pay for the treatment of their sick, and you must at least bury their dead. After their poverty has exhausted the provisions of the law, it seizes hold of the skirts of your benevolence and will not let them go until it receives a dole.

My object throughout this address has been simply to raise in your minds the question—"Does it pay to have such houses and such people in the City?" This seems a sordid question, but after all it is the case that the claims of social morality and the dictates of practical Christianity work themselves out in the civic and national ledger. In view of the facts before you there can be but one answer to the question. The city which imagines it can save money by letting District 14 alone reminds me of a man who has a limb which throbs and aches with some chronic disease, while his body wastes with hectic fever and sleepless nights, yet he refuses to part with the limb.

Observe how nature deals with such districts. As I pointed out to you, District 14 consumes more life than it produces. It is the largest continuous area in the city of which it can be said that the deaths every year outnumber the births; but this is a characteristic of those blocks and isolated tenements which are scattered about the city. All you have to do is to draw a cordon round them, so that no recruits shall join the inhabitants, and year by year their inhabitants would dwindle away and ultimately become extinct. What can we do to prevent the ranks of this class from being recruited? I believe one of the most important steps we can take as a community—a step without which no others will avail—is to get rid of the unwholesome tenements to which they are attracted as iron is to a magnet. I have heard it said we must have such places for such people, but I deny it. The man who says so, who is generally the owner of such property, would shrink from becoming known as the landlord of thieves and loose persons. I noticed this wholesome feeling in a recent discussion of the Town Council with reference to the property held by the Improvement Trust in this very district. To speak of building houses to be let to the inhabitants of insanitary dwellings, is to speak of something which never has been done and never will be done. What is done is to select respectable, steady tenants, and put a caretaker in every block, and if the class of people referred to choose to become such they can get suitable houses at any time. They never will while their present dwellings are allowed to exist as they are. In this district there are shops where the beggars sell the bread and scraps of meat which you give them, that they may procure drink with the proceeds. The inhabitants buy those scraps rather than wholesome food, that *they* may have more money to spend on drink, and they resort to these houses for no other reason. In the main, it is not want of money, so much as want of self-restraint in the use of the money they have, which keeps them there. Nothing shows this so well as the system of sub-letting which prevails in District 14. I have received from the City Assessor a list of houses which are held by 16 persons in this district. They are 116 in number. The total rental paid to the proprietors is £537 8s. The average rent of each house is therefore £4 13s.—some are rented as low as £2 10s. All are sub-let in rooms, or even parts of a room—generally to husbands and wives, frequently with children—at 6d. to 8d. per night. True, they get furniture, bedding, and cooking utensils; but as a rule these are of the most meagre, miserable description. This means £7 16s. to £10 8s. per annum for a fraction of a house. One man in this district leases 36 wretched houses, for which he pays £122 2s., an average of

£3 8s. a year. The sub-tenants pay 6d. to 8d. per night; Sunday does not count, but on each other day this sum must be paid in advance. Nor are these casual tenants; they live there and pay these extravagant rents for months or even years. If you point out to the sub-tenants that they are paying sums which would secure the best one and two-room houses in the city, simply because they never have a month's rent in hand, you generally discover—what other signs sufficiently show—that their position is the same as that of the fast young man who borrows £50 on a £100 bill, and pays 10 per cent. on the full amount of his bill.

These opinions of mine may seem harsh, but they are formed from a study of the facts from the inside; not from a surface view acting on an impulsive, vague philanthropy. I am glad, in conclusion, to refer you to two opinions based on the same method of close internal study which are in entire agreement with those I have now expressed to you. One is that of Miss Octavia Hill, which you will find in a paper published in the *Nineteenth Century* (September, 1889), entitled "A Few Words to Fresh Workers." She points out how frequently one finds unhealthy courts crowded in close proximity to healthy blocks where there are numerous vacant houses. She asks and answers the question—"Why is this? The sympathetic visitor is too apt to jump to the conclusion that in the healthy blocks the rents are too high for the tenants in the court. Will he inquire what the rents are in each? If he does, ten to one he will find the rent, room by room, far cheaper in the healthy blocks than in the court. He will find that in many—I had nearly said most—instances the reasons why the good rooms stand empty and the bad ones are full, are these:—(1) In the court, overcrowding and sub-letting are tolerated. (2) The rent, nominally high, is either only half paid or is reduced by sub-letting and overcrowding. (3) The drunkenness and profane language, violence and destructiveness, tolerated in these courts would not be allowed by any respectable landlord or neighbours. (4) Bad characters are allowed to frequent the courts." For these reasons she is opposed to the application of rates to the provision by public authorities of houses which will compete with an already sufficient number provided by private enterprise, under proper building and sanitary regulations.

My other reference is to a series of recommendations adopted by the Health Committee of Edinburgh, after full consideration of a report by the burgh engineer upon the insanitary condition of St. Giles' Ward in that city. These recommendations are six in number, but I omit the 4th and 6th, as they are only of local importance:—

"1. That, with the approval of the Magistrates and Council, it should proceed in the work of closing insanitary and uninhabitable houses, as, from inquiries made, the Committee is satisfied that the parties removed from such houses readily find accommodation elsewhere, and it is believed that in most cases they are quite able to provide themselves with better dwellings.

"2. After consideration of statistics relating to St. Giles' Ward, the Committee is of opinion that the number of licensed houses in the district is largely in excess of its requirements, and that by the temptation thus offered to those with little self-control, the work of the Committee is opposed and many evils caused, some of which are expressed in inferior houses and a high death-rate.

"The Committee therefore recommends that the Town Council should put these opinions before the Magistrates, with a request that they should, as opportunities present themselves, reduce the number of licensed premises in this ward.

"3. That whenever uninhabitable houses, or other property situated in this densely-populated district, can be acquired at a reasonable figure, such property should be secured by the Town for the purpose of being reserved as open spaces, and for the improvement of the sanitary condition of the locality.

. . . .

"5. The subject of water-closet accommodation is one which engages the attention of the Magistrates and Council regularly, and the Committee recommends that, as heretofore, the owners of properties should be required to provide sufficient accommodation wherever necessary."

. . . .

These recommendations were unanimously adopted by the Town Council of Edinburgh only last month, and I think, on the facts which I have submitted to you, they are equally applicable to District 14 and other portions of the City of Glasgow.

PUBLIC HEALTH AND SOCIAL PROBLEMS.[1]

There is in all the world no spot from which we could better study the industrial age than that on which we now stand. The University is indissolubly associated with the name of James Watt—the informing spirit of that age. From this hill we look forth upon a landscape which, as it left the hands of nature, was as fair as eye could see, but which now, when visible at all, discloses a bleared and blackened visage through a veil of smoke.

---

[1] An Address delivered before the Glasgow University Medico-Chirurgical Society, 4th February, 1898.

The city of Glasgow is itself the most eloquent illustration of the social results of the application of steam to prime movers. So long as the human hand is the motive power, men are not necessarily drawn together in community of labour. With the use of wind and water comes the factory system, but the factories must go where the wind and water are to be had. The hand-loom weaver lives in villages; the power-loom weaver, so long as the power is wind and water, congregates on breezy heights and beside isolated rivers in groups which have their natural limitations. The spinster spins at home. Steam changes all that. The power is brought to the factories in the shape of coal. Manufacturing towns spring up on sites which attract by facility of production and distribution, and grow without natural check or limit. And so with other industrial occupations. If a coalfield is convenient they cluster round it, or a population grows up maintained by getting and shipping or training the coal to seats of industry elsewhere. If ironstone is found in proximity to coal they, in combination, attract the most portentous aggregations of human beings. Thus whole counties become practically urban in character. The country becomes a vast workshop. Ports are required from which to send out the product, where to receive and whence to distribute the merchandise which comes in exchange. It seems fitting that Watt should have been born on the banks of the Clyde—a river which flows through the richest coal and iron fields in the kingdom, and spreads its arms out at its junction with the sea as if to welcome the merchant ships of the world.

The first Government census of the United Kingdom was taken in 1801, which is therefore a datum point to which we must make frequent reference in measuring the growth of the population. The nation was then in the middle of its deadly struggle with France. Mistress of the sea, our trade had flourished. Stimulated by the necessities of our markets, the means of production had been extended by mechanical inventions, the efficiency of which was increased almost beyond estimation by harnessing them to the power of steam. Standing where we now do, a thread of interest in the prosperous life of a citizen of Glasgow becomes clearly visible. The estate of Gilmorehill had been purchased by a West India merchant, on which he erected in 1802 the house round which the University was built. We can imagine Mr. Bogle surveying from this height the distant prospect of the city of 1801. It had a population of between 77,000 and 78,000, about the same as that of the burghs of Govan and Kinning Park at present, all congregated within a short radius of the Cross. He would see the thin smoke of it rising beyond Blythswood Hill. But little evidence of the age of steam would be visible from Gilmorehill in 1801. The coal pits were chiefly at the east end. The stalk of the first steam-driven cotton mill at Springfield might be seen to the left of Yorkhill. But the city fairly started with the century in the van of industrial development. In 1811 there were over 100,000 people in the city and suburbs. So year by year the population thickened, the central city filled up and overflowed, and even further, like lava over the plains on the skirts of the volcano, spread the stony sea, submerging field and farm, hedgerow and tree, until now within a radius of four miles from the Cross of Glasgow there live a million of people.

I have dwelt upon the industrial aggregation of population in this locality, in its history and causation, with some minuteness in order to give local colour and interest to our thoughts. The circumstances which made this country as a whole into a workshop for all nations, everywhere massed her population into great cities, the like of which had never been seen in the world before, cities made up not of danglers about courts or parasites upon the industry of others, but of men who lived by the sweat of their own brows and the prowess of their own right arm. Just as the coal and ironstone of Lanarkshire overwhelmed the agriculture of the Clyde valley and planted Glasgow on the water-way to the sea, so did the coal fields of Northumberland and Durham, of Lancashire, of Yorkshire, of Staffordshire, and of South Wales. One attracted the cotton trade, another the woollen, one pottery and hardware, another iron smelting and its diverse developments. Wherever there was a convenient estuary or tidal river, shipbuilding and marine engineering were established, harbours sprang up and great mercantile cities.

If you could imagine yourself, from some superior vantage ground, with an omnipresent eye, watching the movements of the denizens of earth as one observes the hurrying to and fro of a colony of ants disturbed by the removal of a stone beneath which they have been dwelling unseen, you would observe that the movements of men are quite as complicated. In the main their motive is the search for a subsistence. Amid the devious wanderings of individuals crossing and doubling on one another's tracks, you would note certain steady lines of travel, all leading from the country into cities. Cities do not grow slowly by the steady surplus of their births over their deaths, but by the rapid influx of adults. With the varying briskness of local trades these great tides of men ebb and flow. Sometimes a steady flow becomes, with the decay of one local industry, a steady ebb, or with the prosperity of another, an overwhelming flood. These are characteristics which, as we shall see, are fraught with danger to the public health. They also show that the movements of the population of a country as a whole give us no idea of the rapid transferences of population, causing great local trouble which may be going on within.

Aggregation cannot be discussed with precision as a physical condition until it has been expressed in terms of the area upon which it exists. Here we encounter a difficulty arising from changes in administrative boundaries. Thus the area of the burgh of Glasgow between 1636, when the charter was granted, and last year has been, by successive extensions, very irregular both in occurrence and magnitude, increased from 1768 acres to 12,311 acres. The area of the country as a whole has always been the same, and the most stable sub-divisions are the counties either "civil" or "registration." I therefore take my statistical illustrations from England and Scotland and their counties, beginning with Scotland. Between 1801 and 1891 the population of Scotland increased 150 per cent. but coincidently the population of Lanarkshire increased 608 per cent. Putting these figures in another way, whereas in 1801 only 9 per cent. of the inhabitants of Scotland lived in Lanarkshire, in 1891 there were 26 per cent. In fact, in 1891 the inhabitants of this county were within half a million of being as numerous as the inhabitants of all Scotland in 1801. When we find that in those same ninety years Renfrewshire added 270 per cent. and Dumbartonshire 356 per cent. to their populations, we realise how the population of Scotland has steadily accumulated in its south-west corner. In England the conditions which foster industry are both more lavishly bestowed and more equally distributed. Consequently illustrations of urban growth are more numerous, and though there has been a withdrawal of the population from the Southern Counties, the aggregation has been distributed over the Midlands and North. Between 1801 and 1891 the population of England and Wales increased 226 per cent. but coincidently the population of the West Riding of Yorkshire increased 325 per cent. and of Lancashire 479 per cent. Glamorganshire presents the most remarkable illustration in the country of a purely rural county, slumbering, so to speak, over untold mineral wealth, entirely unconscious of its existence, and transformed by its discovery into a sweltering land of coal mines, iron works, copper, tin, and lead-smelting works, its shores lined with docks and bristling with the masts of ships. Such is the wondrous tale, excelling all the marvels of Aladdin's lamp, which is hidden in the dry bones of this bit of statistics, that between 1801 and 1891 the population of Glamorganshire increased 835 per cent.

One more illustration only I shall give of those changes in the distribution of population which have such vast social, political, and hygienic importance. In 1801 the now world-famous name of Middlesborough was borne by an unknown village of 412 inhabitants in the West Riding of Yorkshire. They slept over a gold mine. I am disposed to say they were happy in their ignorance. Their dreams were at least pleasant. In 1831 this village still slept. It had only attracted 156 new inhabitants in 30 years. Then came the deluge. On an average in each of the next 10 years it added to its population more than the total accumulation of all its previous existence. Thus "it grew and it grew and it grew," like the vegetation of a nursery tale, until it became necessary for registration purposes to form it into a separate district, which in 1871 had a population of 61,000, and in 1891 of 121,000 persons.

The undeviating tendency of these internal movements is to transfer a greater proportion, as every census proves, from the conditions of rural or village life to those of urban life. The growing proportion of the population of England which lives in London, and of that of Scotland which lives in Glasgow and its suburbs, gives a fair index of this social phenomenon. In 1801 London contained 11 per cent. of the inhabitants of England; in 1891 between 19 and 20 per cent. In 1801 Glasgow and suburbs contained barely 5 per cent. of the inhabitants of Scotland; in 1891 20 per cent. We have therefore to contemplate not merely an increase in the population of the country as a whole, but its concentration more and more into dense masses, in other words, the bringing together of men within confined spaces. We may take it as an axiom that in a manufacturing country such as ours, which produces only a small proportion of the food which it eats, and gets it chiefly from other countries in exchange for the produce of its factories and workshops, the population will increasingly accumulate in the towns. Still further, if the population of such a country is found to be increasing rapidly with each successive census, this means, not the increase of the rural population, but the increase of the urban. As a matter of fact, 73 per cent. of the population of Scotland and 72 per cent. of the population of England and Wales were living under urban conditions in 1891.

As I look at these percentages creeping up from decade to decade, they become not merely sanitarily but socially and politically eloquent. They mark the emancipation of the people from obscurity.

> "Not kings and Lords, but nations,
> Not thrones and crowns, but men."

It is difficult for an agricultural population to realise its strength. But in cities the numerical superiority of those who are employed over those who employ cannot be hid, and must suggest thoughts. Physical aggregation promotes moral association. Following Watt's discovery, there comes a period of English history which the historian demarcates as "The Conflict with Democracy, 1789-1827." We are not here and now concerned with politics, but multitudes have a profound, even a pathetic, interest to the sanitarian, and, as I consider them from my point of view, I cannot shut my eyes to their fortunes and misfortunes, their virtues and their vices. I see them wakened up by the Revolution in France, then becoming definitely visible through the "hurricane eclipse" of the Napoleonic wars; fighting for their country as vigorously in the factory and workshop, with the help of steam, as their brothers under arms in the Peninsula or afloat with Nelson; starving when the peace they had helped to win left the Continent free to compete with them in the arts of peace; in the blindness of despair, burning mills, clamouring for the suffrage, rioting, ridden down by the cavalry at Peterloo; gradually gaining the protection of the Factory Acts and emancipation from the new slavery of the apprenticeship system; secured from starvation by the abolition of the Corn Laws and the adoption of Free Trade; finally, struggling through Chartist riots towards political enfranchisement and the Ballot Act. There, masters of their own destinies, we may leave the Democracy.

I ask you to note how closely this history is connected with aggregation. The dire necessities which create the aims for which the people strive and which persistently urge and stimulate the strife, the vigour and manifest strength which conduce to success are all essentially connected with aggregation. Here is the point of contact between public health and social problems. By contiguity and co-operation man is much advantaged every way, but he poisons his environment, and, if this tendency is forgotten, in certain circumstances of aggregation the whole fabric of his social organisation may be broken up and communities blotted out. Examples abound. We find them in the plagues and pestilences of history, in the fevers and sicknesses of camps and gaols, in the diseases which follow overcrowding in the "warrens of the poor," in the fact that, if the registration districts of a country are grouped after the most careful adjustment so as to reduce them to a parity as to every other condition (age-distribution, sex, &c.) according to their death-rate over a perod of, say, ten years, it will be found that, *pari passu*, as we rise from the lowest to the highest death-rate, we rise from the lowest to the highest density.

What are the condition of life underlying density in industrial towns? *Here* one has not to go far in search of an illustration. It is remarkable with what unanimity in the seventeenth and well on into the eighteenth century travellers extol the amenities of Glasgow. From travellers in the seventeenth century I could multiply quotations into a chorus of praise. I shall only quote a single reference from the fastidious and candid Samuel Pepys, who, under date 19th May, 1682, wrote to a friend from Berwick, whither he had gone in the retinue of the Duke of York, that, among other places, he had visited Glasgow, "a very extraordinary town indeed for beauty and trade, much superior to any in Scotland." Even in 1803 Mayne wrote in his poem "Glasgow":—

> "Look thro' the town, the houses here
> Like noble palaces appear;
> A' things the face o' gladness wear—
> The markets thrang.
> Bis'ness is brisk, and a's asteer
> The streets alang!"

But I am afraid things were seen at that date through a poet's eye. After the fashion of mankind, Glasgow was even then dancing gaily along in the primrose path of the new era. "Bis'ness was brisk." Cotton factories were being started as fast as the firm of Boulton and Watt could supply the engines. The merchants, manufacturers, and shopkeepers were building themselves houses in streets and squares on the hills to the west. The working people were pouring in from the country to occupy the houses in Saltmarket, the High Street, and the various wynds and vennels extending therefrom. In that age the hygienic standard even of a Glasgow bailie or a tobacco lord was not high; and when every room in the house which they vacated was occupied by a family from the Highlands or Ireland it was depreciated to nothing. Typhus fever soon found this out. But all went merry as a marriage bell while "bis'ness was brisk" and wages good. A fast life may be an unhealthy one, but, so long as the "riotous living" can be kept up, there will be no grumbling. The overthrow of Napoleon brought bad trade. "The smouldering fire of fever" burst into a flame, and the wynds and vennels of Glasgow sprang into notoriety. The records of the first half of the nineteenth century tell a very different tale of Glasgow from those of the seventeenth and eighteenth. Its squalor, its filth, its overcrowding, its crime, its disease, like its density, were unexampled in extent and intensity. Royal Commissioners, after going the round of all the manufacturing towns in the island, were compelled to say that, though the condition of all was very bad, the condition of none was so bad as that of Glasgow.

From all this we learn what density is as we have hitherto known it, and as it tends and will always tend to be. In the search for subsistence men rush together. The cast-off houses of the better-off pass, like their cast-off clothes, into the possession of the labouring classes; where new houses are built, they are run up in strait lanes and sunless, airless courts; there is no space for the necessary apparatus, still less for the conveniences, of civilised life; no space for the children; no space for the sick; no space for the dead. Factory is added to factory, workshop to workshop, warehouse to warehouse, and still the city spreads and devours the country. The earth seems to grow chimney stalks; the highways become streets; the burns become loathsome and are buried out of sight in sewers; the rivers lose their sparkle and are expressionless as the eye of the dead; they stink like the river of Egypt; the fish die in them; the wells become poisonous; the air thickens; the sun is blotted out; the trees die; what we, with pleasing melancholy, call grass is mostly weeds. Well might the Corn Law Rhymer sing:—

> "All unlovely as an eyeless skull
> Is man's black workshop in the streeted waste."

Such, and much more is bracketed together in the conception of density as a standard of health. It is essentially a perversion or subversion of nature. Its evils may be redressed. We may live in society and yet not the sooner die. This I conceive to be the function of public health. The modern industrial revolution brought people together with disastrous results. To sanitation belongs the task of showing how men may live in cities and be healthy. Hygeia is the handmaid of Industry.

When I told you of the increase in the population of Scotland, of England and Wales, and of certain counties between 1801 and 1891, since the area on which the population lives has always been the same, the percentage of increase in population represents the percentage of increase in density. We have not got an authentic record of the vital statistics of the nation throughout those ninety years. A system of national registration was commenced in England in 1837, in Scotland not until 1855. The first decade which rests fairly on the basis of an ascertained population at both ends is 1841-50 in England, and 1861-70 in Scotland. During those ninety years, therefore, of increasing density, we can note the death-rate which prevailed only during the last five decennia in England and the last three in Scotland. The mere fact that those Registration Acts were passed indicates an awakening interest in the health of the people. They made sure that the facts, at any rate, should be known. There was, however, hardly any steady administrative effort put forth in the promotion of public health until 1850, after certain general Acts began to be applied which were passed within the preceding five years. As to the state of things prevailing in the years preceding the Registration Acts, no one questions the existence of an amount of disease and death in excess of anything recorded when records began to be made. In 1775 a contemporary statistician tells us that in England in "great towns" the annual mortality ranged from 43 to 53; in "moderate towns" from 36 to 42; and in "country parishes and villages" from 20 to 25. This was before the acute condition of the industrial epoch had been reached; before typhus had become epidemic; before cholera had reached our shores, although smallpox was still working its deadly will unrestrained by vaccination. The laws of nature and the constitution of man have always been the same. The physical conditions of our towns and their results upon health have been seen, described, and recorded by men who are still alive; they projected within the period of national statistics. We can conceive, then, the task which lay before sanitation. You may have watched a strong man launch his boat into a swift-flowing river, and observed how he is swept away at first, how he gets out his oars and brings the bow round to the current, how his first strokes merely lessen the speed with which he drifts, how after a bit he ceases to drift and becomes stationary, and then, after an interval of doubt as to the result, he begins to move steadily up stream. Let us carry this simile into the interpretation of the following figures, with this difference, that the stream against public health always ran more rapidly—density increased as the years rolled by. It increased in a way which cannot be expressed merely by the proportion of the whole poulation per unit of the whole area of the country. A larger and larger proportion of the people became aggregated in towns, and these clustered more and more in certain counties.

In Scotland, in the three successive decades between 1861 and 1891, the general death-rates were 22.1, 21.7, and 19.2; the death-rates under five years were 61, 58, and 51 per 1000; the infantile death-rates[1] were 121, 123, and 119.

In Lanarkshire, in the same decades, the general death-rates were 27.3, 26.6, and 22.1; the death-rates under five years were 87, 83, and 68; the infantile death-rates were 149, 145, and 136.

In Renfrewshire, in the same decades, the general death-rates were 26.1, 24.6, and 21.2; the death-rates under five years were 81, 71, and 63; the infantile death-rates were 141, 134, and 125.

---

[1] The deaths under one year of age calculated per 1000 births.

In England and Wales, in the five successive decades between 1841 and 1891, the general death-rates were 22.3, 22.2, 22.4, 21.3, and 19.1; the death-rates under five years were 66, 68, 68, 63, and 57; the infantile death-rates were 153, 154, 154, 149, and 142.

In Lancashire, in the same decades, the general death-rates were 28, 26, 27, 25.2, and 22.4; the death-rates under five years were 97, 91, 91, 82, and 73; the infantile death-rates were 192, 186, 183, 172, and 166.

In the West Riding of Yorkshire, in the same decades, the general death-rates were 23, 24, 25, 23, and 20; the death-rates under five years were 72, 78, 81, 75, and 63; the infantile death-rates were 163, 170, 178, 166, and 156.

In Glamorganshire, the aggregation of population has been more recent and more rapid than in these counties, and is still going on. Our imaginary rower has, in the case of Glamorganshire, barely asserted his supremacy over the opposing current. In the five decades between 1841 and 1891, the general death-rates were 23, 24, 23, 22, and 20; the death-rates under five years were 69, 77, 70, 59, and 62; the infantile death-rates were 146, 154, 137, 144, and 152.

I might have quoted the much more striking death-rates of the large cities, some of which are the vital centres of these counties. These would show decreases of from 20 to 30 per cent. during the last thirty years. I venture to predict that, when the decade which is now near its close is completed, the reinforcement of the efforts of the towns by the labours of the recently reconstituted health authorities of the counties will exhibit a greatly accelerated rate of improvement.

It comes to this, then, that while the country as a whole is becoming more densely populated, while every year a larger proportion of the total population is found living in cities, the death-rate of the country, as a whole, has gone down, and the decline is most marked in the largest cities. Not only is there less loss of life among the strangers who are within their gates, but the children who are born there are being reared to maturity in larger numbers. Nor is this a random effect; it is as precisely related to the methods of sanitary administration as the defeat of the French was to the strategy of Moltke. The evils of density which I specified are being redressed, and how simple and natural are the principles followed, though they are worked out through an infinity of detail—fresh air, sunlight, pure water, space, cleanliness within the house and without, in the factory and in the workshop. Much has been done, but more remains to do. When Dr. Farr pointed out the relation of density to health he reduced it to the exactness of a formula. He said on the evidence of four years, 1838-41, that "the mortality of districts increased as the sixth root of their densities." Thirty years later he said it was as the twelfth root. He expressed the law quite dogmatically in these striking words, "The greater the proximity of man to man, the greater is the mortality." It is obvious that there is a range outside of which the proximity of man is indifferent. In other words, density only becomes effective when a certain proximity is overpassed. In so far as the influences of density upon health are physical, they are avoidable. As the vital statistics of each successive decade are made up, we find that people are living nearer to each other and yet living longer. The average lifetime of every child born between 1838 and 1852 in England was 40.88 years; of every child born between 1871 and 1880, 42.98 years; and of every child born between 1881 and 1890, 45.42 years. I see nothing in the nature of things to prevent towns being made as healthy as the country. I am certain it can only be done by what Charles Kingsley called "a complete interpenetration of city and country." There is an intensification of moral as well as of physical evil which dogs the aggregation of men. It may be that this—the elements of selfishness, of drunkenness, of laziness, of uncleanness of life, of dishonesty, of ignorance—will always exist in sufficient quantity to keep the death-rate of cities above that of rural districts; but I repeat that I know of nothing in the physical laws of the world to render it hopeless to aim at making the town as healthy as the country. On the contrary, I see in the progress which has been already recorded ample evidence that it is hopeful. Already the "town districts" of England and Wales have reached in certain years a death-rate which thirty or forty years ago was regarded as a healthy district-rate, viz. 17 per 1000 living.

What is the fulness of the meaning of a lowered death-rate? How can I bring it home to you? Marshal all the physical facts which constitute the scientific conception of summer and winter, and how much nearer are you to knowing what they are? A few hours more or less of sunlight, a few degrees more or less of heat, a few inches more or less of rain; a mile or two of velocity, a pound or two of pressure more or less of the wind, and a point of change in the direction from which it comes, that is all the difference, and yet summer is life and laughter, winter is death and tears. It is much the same with the statistical expression of the movements of public health—a unit or two or only a decimal fraction of a unit more or less, that is all, whether we adhere to the simplicity of a death-rate or resort to the intricacies of a life-table. Yet the social and economic difference would require pages of disquisition to follow out and picture forth. A quotation from

Farr will at once put our thoughts in order regarding the economic aspects of death and disease. He says,[1] "The labour of the parents, and the expense of attendance, nurture, clothing, lodging, education, apprenticeship, practice, are investments of capital, at risk extending over many years; and the return appears in the form of the wages, salaries or incomes, of the survivors, commencing at various ages. . . . The outgo increases from infancy up to a certain age; the earnings then commence and ere long equal the outgo; they are subsequently in excess throughout manhood, and at advanced age decrease, until they are extinguished amidst the feebleness and infirmities of old age. The present value of the person's probable future earnings, *minus* the necessary outgo in realising those earnings, is the present value of that person's services. Like capital invested in the soil, in the vintage, or in a commercial adventure, the capital invested in the life of man returns, in happy natures, profit of a hundred-fold; in other cases fifty, twenty, ten-fold; in others it is barely returned; in some it is entirely lost, either by death, sickness, vice, idleness, or misfortune."

This means that every year in the expectation of life which you find in a life-table opposite each age from 1 year to 100 has its money value, which is the balance between the outgo and income of the anticipated future of a person at that precise age. The death of a child entails an actual loss in proportion to the years of its unproductive life. The death of an adult just beginning work entails the loss of the whole capital invested in the life. The death of the aged differs from that of the child in that, while the child cannot possibly be anything but a consumer, there is scarcely any age at which the old person may not still be a producer. If we fix our attention upon death we are apt to forget disease. The fact that the popular standard of health is the comparative prevalence of death leads us to this limitation of thought. We drop into the fallacious habit of dissociating death from disease, of forgetting the living while tabulating the dead, a mistake which is at the bottom of much of the criticism tending to *laissez faire* to which sanitation has been subjected. Death, in the main, is to the individual the final event which emerges from causes prejudicial to health which act upon the community. The effect is not uniform. It is graded in intensity from the black of extinction, through the grey of impairment, into the vanishing shade of a transitory indisposition. If, therefore, the death-rate is lowered, you have not merely fewer death-beds, but you have fewer sick-beds, not merely fewer funerals, but less expenditure for the care of the sick.

---

[1] *Vital Statistics*, a memorial volume of Selections from his Reports, etc., p. 532

There are various aspects in which these connoted results of a diminished mortality may be viewed. They show how much more deeply, and widely the prevention of disease touches social problems than the curing of it. A sick man made well is not merely restored to the number of producers—he is taken from the number of those who must be maintained. How much better is it to keep him among the producers, not to allow him to become even a temporary burden to his family or to society. A sick child made well is not made less of a dependent and a consumer, but it may be restored to a maimed and impaired life; and, therefore, to a more prolonged, or even a lasting, dependency. In short, of the children born into the conditions of a high mortality, not merely do a larger number die, but those who survive are weighted in the race of life. The dead have no influence on posterity, but the living may propagate their taint. The number of recruits or conscripts rejected on account of physical defects is greatest where the death-rate is highest. I cannot follow Lombroso in his physical theory of morality, which seems to assert that you can discover a criminal by dissection; but I do maintain that it is among the cracked vessels you are more likely to find those which are made unto dishonour. Not only the insane, the imbecile, the idiotic, but the criminal will be produced in greater abundance in the unhealthy than in the healthy population. This much the congenital and pathological abnormalities which Lombroso proves to exist in undue proportion among criminals undoubtedly warrant us in maintaining. It follows, then, that as the "expectation of life" is lengthened, the *quality* of the life is improved. The physical basis of life is sounder, and there is less loss of working time in repairs. This means lighter social burdens, diminished poor-rates, less charitable outlay for the treatment of the sick, lower rates or more liberal dividends for life insurance and friendly societies. In short, a healthy city will be found to be a cheaper city to live in than an unhealthy.

I have intentionally shunned the quantitative method of presenting the economic effects of death and disease. The late Sir Edwin Chadwick gave great prominence to such calculations. They always remind me of the favourite device of people who wish to raise money, say, £1000. It is obvious that if 1000 persons give one pound a-piece, you have your £1000; but if 2000 persons give 10s., or 4000 5s., or 8000 half-a-crown, you would obtain the same admirable result. So you have got a certain population at working age, and if one can produce authority for saying how many persons are continually sick for every person who dies, a simple calculation will give the number of workers who are ill all the year round, who, so far as social economics are concerned, might as well be on strike, or in prison, or insane, or otherwise conspicuously and avowedly thrown as a burden on the community. It depends upon the figure we take for their average wage how many thousands or millions will represent the direct loss in wages. Such calculations are not necessary to establish the general principle that death and sickness mean at least money-loss, that the deaths may be reduced and a large proportion of the disease prevented, so that we virtually have in sanitation a gold mine at our door—at the door not merely of the nation, the city, or the ratepayer, but of every man, woman, and child, for all have a share in the prolongation of life and the redemption of days from sickness. No one can say of *this* distribution of capital that it enriches the rich and impoverishes the poor. It enriches the poor and gives only a little to the rich.

Two quantitative illustrations of this principle may vivify its apprehension. In the army we have men got together for a definite purpose, and every fact as to their health is systematically recorded; so that we could not have a more precise or accurate example of the economic importance of sickness. In 1895 each man in a force of 99,795 stationed in the United Kingdom was unfit for duty from sickness, on an average, 15.24 days; in other words, 4167 men were always non-effective, and the fighting strength of the army on home duty was reduced by that number. Even at 1s. per day that means more than £76,000 per annum paid to men who gave no return in service. Not only so, but to minister to these men, doctors, nurses, and others had to be paid, and material outlay incurred. The greater proportion of this sickness was preventable. My other illustration is drawn from the experience of the Manchester Unity of Oddfellows that in each year their members lose on an average 9 working days from sickness. If we apply this to the population living, aged between 15 and 65 in 1891 in Great Britain, we find that it is equivalent to the burden of maintaining 572,000 adult persons in constant idleness. At 10s. per week this represents a direct wage-loss of £14,886,000 per annum. Such an improvement in health as would take only one day off the average sickness would reduce the number constantly sick by 63,600, and the loss by £1,654,000. It would be a mere matter of the application of similar data to such diseases as are notoriously preventable, for example, to phthisis and the diseases popularly known as infectious, to show that millions a year are lost directly and indirectly through their prevalence.

So much for what may be called the ponderable relations of public health to social problems, but we cannot bring all the results of the environment of a man into the pages of a ledger, and work his life out into the simplicity of a balance sheet. "The life is more than meat and the body is more than raiment." Consider what is likely to be the product in character and temperament of the healthy and the unhealthy city. Do not be vague in your thinking. Call up before you the conditions of unhealth which I described, and which are bracketed in the conception of density. Are they lovely though deadly, are they pleasant though poisonous? If they kill the body, do they ennoble the spirit and sanctify the soul? Is death in the wynds a euthanasia? Is disease made comely there by some drapery of dreams and hallucinations? If when we enter these precincts with dainty feet, stepping warily, with garments carefully drawn closer to our shrinking limbs, our every sense is outraged, and strange thoughts stir in our minds, and the world seems more unintelligible than ever; if, when we regain the open street, we feel as if we had escaped from Hades and stood once more amid the fields of Enna; if all this be so, what of the people who *live* there? What of the children who are *born* and *grow up* there? What sort of citizens are they likely to turn out under the perpetual influence of conditions which have, in a few minutes, so disturbed the placid currents of our lives? What sort of a man is he likely to be who stumbles up and down through the twilight of those stairs night and morning, where sickness is never absent, where death is frequent, where the ambulance driver carrying the fever patient, or the undertaker's men piloting the coffin down the strait passage to the street, are familiar obstacles! What sort of a woman is she likely to be who has to lie helpless in her sickness in full sight of her neglected children, with all her domestic responsibilities hanging like a millstone about her neck; whose life is a never-ending struggle with penury, and her housekeeping a sad debate between food for the healthy and medical advice and medicine for the sick, in the expenditure of the last coin held in the hesitating hand? And the children of such parents, the rickety and enfeebled survivors of the great troop of infants who have found their way into the world by that stair—how can love of home, city, or of country grow up in such circumstances? Is it not more likely that their hearts will be filled with bitterness and class hatred, and harbour a sense of injustice and of wrong suffered at the hands of some one, of any one, of every one?

Gentlemen, this is not the material on which to build a stable state. Is it conceivable that people so circumstanced will believe that they live in the best of all possible worlds and be sticklers for the existing order of things? On the contrary, all my observation of the present, and all my reading of the past, tells me that the natural growth of such a soil is discontent. In truth, it would be sad if it were otherwise. If all free men were healthy and well fed, they would be happy and content. Dissatisfaction with present conditions leads to projects for securing better. Misery begets social unrest, and the heart of misery is ill-health. *Les miserables* are always foremost in revolutionary projects. You may have philosophers and philanthropists dealing with the social fabric as with a box of bricks which they tumble out on the floor of their study and build up into a structure to please their fancy or their theory. But even this is seldom a mere academic exercise. It is prompted by dissatisfaction with the existing state of things. In any case, the masses are never led into revolution by their intellects. It is by appeal to the physical discomforts of life—to their own misery or to the misery of their fellow-men. Whatever they may inscribe on their banners, it is misery which is behind. The six points of the people's charter were coveted, not for themselves, but as means to an end. But for wheat at 70s. a quarter and the horrible conditions of life of the working classes in our large towns, there would have been no charter.

If we survey the ideal commonwealths which have been constructed, from Plato's " Republic " down to William Morris' " News from Nowhere," we observe there is a remarkable difference between the ancient and the modern ideals ; a difference not merely such as is imposed by differences in the manners and customs, the political and social constitution of the times. Between such ideal commonwealths as Plato's " Republic," Bacon's " New Atlantis," Harrington's " Oceana," Hobbes' " Leviathan " and the New Boston of Bellamy's " Looking Backward," the New London of Morris' " News from Nowhere " and Blatchford's " Merrie England," there is an essential difference which goes deeper than the age and the country which produced them. The former are the works of men of philosophic intellect impressed with the illogical scheme of the polity under which they live, and the blundering way in which events fall out rather than follow with the sequence of a syllogism. They are the produce of the academy. They show the accomplishments of the forum rather than the knowledge of men and things which is to be found in the market-place. The French Revolution changed all that. Utopia and Oceana are as interesting to read about as Brobdingnag and Laputa, but we take neither the one nor the other seriously. In the age of oligarchy nothing better could be thought of for the regeneration of society than a rigid mechanical system into which human beings should be fitted like the planets in an orrery. That being done, all that was wanted was some one to turn the handle. That age is gone in this country, gone, we had almost said, from Europe, but we remember that it is still "made in Germany." The New Boston, the New London, Merrie England are all possible places. The authors consider the modern conditions of democratic life. Their theories are to be worked out by the people themselves, not imposed upon them by any superior power. Their object is to secure a larger, fuller, more wholesome, happier life for the whole nation. We cannot but accept and heartily pray for the accomplishment of their aims. It is not necessary for sanitarians to become Socialists in order to promote the aims of the Socialist. This is where public health touches, or, more correctly speaking, works in the van of those who are labouring for the solution of social problems.

In that triune conception of an ideal social state, "Liberty, Equality, Fraternity," how much of the negation of equality among men depends upon the health of the individual, upon the physical condition of his body. What avail civil equality, political equality, equality of possessions, as between a man who is in robust health and another who is laid down with a fever, as between a man who has all his limbs and one who has lost a limb from tuberculosis of a joint; who is sound in wind and one who is pigeon-breasted; who has all his faculties and one who has an intellect blunted by a meningitis in infancy; who has all his senses and one who has been made deaf by scarlet fever or blind by smallpox? What equivalence of opportunity can a man have who lives his family life crushed by the physical conditions of a slum—his personal vitality depreciated, his years shortened, his substance drained away by sickness and death among his dependents—yet who can question that, as compared with any other form of equality, equality in health is not a hopeless dream but a reasonable and attainable aim? Nay, more, who can say how much of those other forms of equality would be attained or made easier of attainment by equality or less inequality in the opportunity of health? Disease may make out of any one of us a Dr. Jekyll and a Mr. Hyde. An appeal to Philip eupeptic is as necessary as to Philip sober. The most brilliant in intellect sometimes finds himself temporarily in possession of a brain which, if it were a permanent inheritance or acquisition, would not maintain him above the level of a swine-herd. The casual in such a person may be the usual in masses of men and from equally preventable or remediable causes.

I have read largely in Socialist literature—systematic treatises, propagandist tracts, novels, poetry, popular song books, serial publications. Time would fail me utterly to satisfy you by references and quotations that such literature is saturated, both in its justification from things as they exist and in its promise of the reformation which will ensue upon the adoption of their special theory of society, with questions of public health; questions which have been dealt with, which are being dealt with, and which can be dealt with quite irrespective of the constitution of society. In fact, Socialist literature always reminds me of Charles Lamb's "Dissertation upon Roast-pig." Hoti's son Bobo, by accident, burned down his father's cottage and his pig-stye, and thus discovered the virtues of roast-pig. Forthwith, incendiarism became popular for the sake of enjoying roast-pig. It is not stated that any one ever discovered that it was not necessary to burn down houses in order to get roast-pig, so we do not know how Hoti would have taken the statement. We have, however, in the preface to a translation of Engel's book, "The Condition of the Working Class in England in 1844," evidence that this writer had discovered that between 1845, the date of his book, and 1892, the date of his preface, sanitation had swept away the facts on which he had originally based his attack on capital. He takes the discovery very badly. The passage is worth quoting:—"The repeated visitations of cholera, typhus, smallpox, and other epidemics have shown the British bourgeois the urgent necessity of sanitation in his towns and cities, if he wishes to save himself and family from falling victims to such diseases. Accordingly, the most crying abuses described in this book have either disappeared or have been made less conspicuous. Drainage has been introduced or improved, wide avenues have been opened out athwart many of the worst 'slums' I had to describe. 'Little Ireland' has disappeared, and the 'Seven Dials' are next on the list for sweeping away. But what of that? Whole districts, which in 1844 I could describe as almost idyllic, have now, with the growth of the towns, fallen into the same state of dilapidation, discomfort, and misery. Only the pigs and the heaps of refuse are no longer tolerated. The bourgeoisie have made further progress in the art of hiding the distress of the working class. But that, in regard to their dwellings, no substantial improvement has taken place is amply proved by the report of the Royal Commission on the Housing of the Poor, 1885. And this is the case, too, in other respects. Police regulations have been plentiful as blackberries; but they can only hedge in the distress of the workers, they cannot remove it" (p. iv.). Observe the magnitude of this last assertion, and how adroitly Engel transfers his attack from the capitalist to the middle classes. His original book was founded on the reports of the Royal Commission on the Health of Towns, appointed in 1843. He now retires upon the report of the Royal Commission of 1885. If he lives to write another preface for another edition of his book in 1902, he will find that the facts of 1885 have followed those of 1843 into extinction. Those academic spinners of social theories habitually use the facts stored up in our blue books for the very purpose of being practically dealt with; and it is their fate to find that, while they have been spinning, others have been working, and lo! when they look at their distaff, they find that their material is not wool, but mist.

I take up a Fabian tract entitled "Facts for Socialists," and I find in succession the facts assorted under those heads, "The Nation's Income," "Who produces it," "Who the Workers are," "How the Idle Rich live," "The Rent of Land," "The Interest of Capital," "Profits and Salaries," "The Classes and the Masses," "The Two Nations," "The Class War." Now, observe, I am not discussing Socialism on its merits, although the argument of these titles is pretty obvious. But if all men are healthy and happy, what does the argument matter? and I confess nothing in these bundles of facts touches me until I come to the next, "Some Victims of the Struggle," where I find infantile death-rates, the average age at death of the nobility and gentry and of the artisan class, the insanitary condition of the slums, the number of paupers, the number of deaths in hospitals, and so on. Then comes the last chapter, "The Evil and the Remedy," and my criticism is that I see the evil, but the remedy is too heroic. At any rate, we can get roast-pig without burning the house down.

In the last chapter of "Looking Backward" I find the most pathetic descriptions of slum life in the Boston of to-day, some passages of the purest Christian sympathy in language which touches one even to tears; but still I am not convinced that Boston cannot abolish those slums until "the age of individualism" has given place to that of "concert" or collectivism, even though it is, as we are told in so many words, "well characterised by the fact that in the 19th century, when it rained, the people of Boston put up 300,000 umbrellas over as many heads, and in the 20th century they put up one umbrella over all the heads." Besides, I note that even in that wondrous age they had an "invalid corps" with a distinctive uniform, the members of which are provided with a light class of tasks fitted to their strength. "All our sick in mind or body, all our deaf and dumb, and lame and blind, and crippled, and even our insane belong to this invalid corps, and bear its insignia."

The polity of New London is, we are told, "pure communism." When we finish the idyllic story of "News from Nowhere" we feel that we have been in the society of the most heavenly and proper set of children, with the years and stature of grown-ups. It is the Earthly Paradise over again. All the sensuous adjectives are exhausted in describing the beauty of the women, and all the heroic in describing the stalwart proportions of the men. Every cheek is ruddy as a rose. Every limb is modelled after the Venus of Milo or the Apollo Belvidere. Centenarians abound. The health of the people is, in fact, gross and apoplectic. The city is ruralised. All the old places are there—Trafalgar Square, Charing Cross, Long Acre, Holborn, Oxford Street—but everywhere there are trees and flowers, and the density of London is less than that of a country village. All the slums are gone, and the memory of them alone is kept alive by an annual festival. It is a centenarian who speaks, "Once a year, on May-day, we hold a solemn feast in those easterly communes of London to commemorate the Clearing of Misery, as it is called. On that day we have music and dancing and merry games and happy feasting on the site of some of the worst of the old slums, the traditional memory of which we have kept. On that occasion the custom is for the prettiest girls to sing some of the old revolutionary songs, and those which were the groans of the discontent, once so hopeless, on the very spots where those terrible crimes of class murder were committed day by day for so many years. To a man like me, who has studied the past so diligently, it is a curious and touching sight to see some beautiful girl, daintily clad and crowned with flowers from the neighbouring meadows, standing amongst the happy people, on some mound where of old time stood the wretched apology for a house, a den in which men and women lived packed amongst the filth like pilchards in a cask; lived in such a way that they could only have endured it, as I said just now, by being degraded out of humanity—to hear the terrible words of threatening and lamentation coming from her sweet and beautiful lips and she unconscious of their real meaning; to hear her, for instance, singing Hood's 'Song of the Shirt,' and to think that all the time she does not understand what it is all about, a tragedy grown inconceivable to her and her listeners. Think of that, if you can, and of how glorious life is grown" (p. 72).

Yes, Mr. Morris, this is all very pretty and very worthy of your aesthetic imagination, but, while you are persuading men that in order to get roast-pig their houses must be burned down, there can be no objection to a more direct and speedy way of getting it. While Bellamy dreams and Morris sees idyllic visions, the Board of Health of Boston and the County Council of London are steadily prosecuting their "Clearing of Misery," and even bringing into the dark places of the city the brightness and sweetness of open spaces with trees and flowers.

"Merrie England" is the most popular, the most widely known, and the ablest of recent expositions of Socialism. I admire the cleverness, the literary art, and controversial adroitness of the author. The reading of it is an intellectual stimulus. Again I warn you that I do not discuss Socialism; I simply wish to show you that the chief arguments for and the chief benefits held out by Socialism are well within the recognised domain of public health. This is apparent from the opening chapters, in which we are told that the bodily needs of man are two, "health and sustenance," the mental needs three, "knowledge, pleasure, intercourse." The argument is that Socialism only will secure those needs for every one. Then we have a chapter, "Town *v.* Country," in which the "factory system" is denounced for four reasons, "(1) because it is ugly, disagreeable, and mechanical; (2) because it is injurious to the public health; (3) because it is unnecessary; (4) because it is a danger to the national existence." The soul and substance of this indictment is count number two, "injurious to the public health." This is made apparent in the elaboration of the indictment in subsequent chapters. We have two maps of the British Isles submitted, one a health map, shaded so as to show the death-rate, another a map shaded to show the density of the industrial and commercial population. Attention is directed to the local coincidence of high death-rate and great density. The ugliness and disagreeableness alleged against the factory system are simply another aspect of the physical causes of the injury to health. We are told that the "invariable accompaniments of the factory system" are "foul air, foul water, adulterated foods, dirt, long hours of sedentary labour, and continual anxiety as to wages and employment in the present, added to a terrible uncertainty as to existence in the future. Look through any great industrial town, in the colliery, the iron, the silk, the cotton or the woollen industries, and you will find hard work, unhealthy work, vile air, overcrowding, disease, ugliness, drunkenness, and a high death-rate." Time fails me to prove to you by quotation that, as Mr. Blatchford begins so he continues, and so he ends his book, by harping on this one string—public health. In chapter v., "The Life of the Worker," the first three of twelve "facts which no man attempts to deny" regarding Britain under the existing social system are—"(1) Large numbers of honest and industrious people are badly fed, badly clothed, and badly housed; (2) many thousands of people die every year from preventable diseases; (3) the average duration of life amongst the population is unnaturally short." One of the oddest ways in which the self-assertion of public health in the mind of the Socialist manifests itself is in the allotment of the leisure which the redistribution of production would give to the people. The proposition is—"If one-third produce enough for all by working nine hours a day, then three-thirds will produce enough for all by working three hours a day." Then Mr. Blatchford proceeds to count his chickens. "So we shall have plenty of leisure. What are we to do with it? One use for it is the acquirement of knowledge. I will give you two very striking examples of the kind of work that needs doing." I doubt if you could guess what these are! The first is "the germ theory of disease," the second is "agricultural chemistry." Surely, gentlemen, the essential conditions of the millennium will exist when every man will not only be his own shoemaker, but his own bacteriologist. One of the last chapters is devoted to the proof of the proposition, "the vices of the poor are due to their surroundings, instead of the surroundings being due to their vices." Those surroundings, we find, are chiefly "slums," "foul air," "polluted rivers," "unhealthy trades," and so on through the familiar catalogue of the physical elements of industrial ill-health. On either theory of vice, the practice of public health would be the same, though its relation to this particular social problem will differ. If the environment causes the vice, its improvement will directly eliminate the vice. If the vice causes the environment, then, having reformed the environment, the law may make it impossible to be vicious and live. The sanitarian well knows that the truth lies between these two propositions.

One more reference to "Merrie England," to chapter xxiv. In the language of Socialism, every one who does not work for his living is "a loafer"—"a loafer may be an idle tramp without a shirt to his back, or he may be an idle peer with a rent-roll of half a million a year." In short, the word loafer "means one who loafs or sponges upon the earnings of other people." We note that in the catalogue of loafers Mr. Blatchford not only enumerates "idle peers," but "paupers, beggars, tramps, criminals, as well as a large army of unemployed workers." In his opinion all these live upon "the labour of the working poor"; and we are told that "under Socialism we should oblige the loafer to work or perish." Now, here an important principle is admitted, that, whatever the constitution of society, provision must be made for the existence of a certain proportion of individuals who, being free agents and having the opportunity of acting otherwise, choose to set themselves in antagonism to the interests of society, and that for such the law is "do this or perish." It is to this law we appealed in referring to the relation of environment to vice. If a man spends his earnings on drink and then seeks to live on garbage, to sleep on stairs, or live in violation of health and decency in a slum, then everything should be done to bring him to this alternative—be sober or perish. To this alternative the methods of public health tend, *e.g.* the closing of uninhabitable houses, building regulations, the prevention of overcrowding, the enforcement of cleanliness, the Adulteration of Foods Act, &c.

But, although we leave to Mr. Blatchford every regiment in his noble army of "loafers," we must, *ex definitione*, add a brigade of our own which will vastly outnumber all the peers, paupers, prisoners, and other nondescripts who do not work and live on the labour of those who do—I mean those who are unable to work by reason of sickness. A prominent wing of his army is that of the "unemployed." Although he claims for all unemployed that "they exist in enforced idleness," it is well known that many, at times the great majority, of the "unemployed" are so voluntarily. No one can ever say that of the sick. Mr. Blatchford's regimen for loafers admits the existence of something in man that may resist amelioration even by the favourable climate of Socialism. The old-fashioned way of describing that something was "original sin." You may call it "inherent cussedness" if you prefer it. My trouble is that, if you admit "original sin" into this paradise, how are you to limit its influence to loafers? Where may this sand cast among the mechanism of your social organisation not turn up? We know there is an irreducible minimum of disease and death of which no modification of environment will relieve mankind. I maintain that the same quality in man which Mr. Blatchford admits will produce the loafer, will in the individual and in society, in the man himself, and among those who in any manner depend upon or in any degree are influenced by him, always tend to an excess of disease and death over that which is the penalty of humanity. This tendency will be strongest where the results will be most disastrous, viz., among aggregations of men in cities. All that is *in* man goes with him into society. All social problems are complicated with this untoward element in man himself, and all social reformers have to reckon with it. I have already said that, although there are no physical reasons why the city should not be as healthy as the country, there may be moral. Let me close by pointing out that, as regards public health in its relation to social problems, the difference between all those social architects and the sanitarian is this, the sanitarian is like the lifeboat or the lifebelt to the drowning man—"a very present help." The theorist is like a lecturer on the art of swimming,—any good he may do is in the future. He certainly will not help the drowning man.

THE CHILDREN OF THE CITY: WHAT CAN WE DO FOR THEM?[1]

Ladies and Gentlemen,—It is now more than a century since a distinguished citizen of this city wrote a book entitled, "Sketches of the History of Man," in which there is a chapter, "A Great City considered in Physical, Moral, and Political Views." He began the chapter with this sentence:—"In all ages an opinion has been prevalent, that a great city is a great evil; and that a capital may be too great for the state, as a head may be for the body." The latter part of this sentence suggests that probably "political" more than either "physical" or "moral views" were at the bottom of the alarm and anxiety inspired into the hearts of kings by the growth of cities. Despots naturally must regard it with jealousy. Cities have in all ages been the birth-places of movements in favour of popular rights and nurseries of political freedom. Still the physical necessities begotten by the aggregation of men have always formed the chief element in the difficulties of their government. The cry for bread was heard as often as the strains of the Marsellaise, in the opening scenes of the French Revolution.

In the case of Paris and of London, attempts were made, at a very early date, by the sovereigns of France and England, to check their growth by direct prohibition. I cannot open up the main purpose of my lecture better than by giving you the reasons assigned for this mistaken and futile endeavour. I need not tell you that Paris and London paid as little heed to those imperial edicts as the advancing waves to the behests of Canute. But the most important of the features of city life which troubled the minds of kings still exist, and nowhere more strongly marked and clamant for reform than in this country and in our day. Now the responsibility has passed with political power from the throne to the people. The difficulties and national dangers inherent in the physical circumstances of cities cannot be better expressed than they were in the language of kings centuries ago, but the centuries have passed and the difficulties and dangers remain. It rests with the sovereign people, in the first place, to grasp as clearly, but in the next place to attempt with more success to solve the problem. The object of my humble endeavour to-night is to help you to the accomplishment of both objects.

The attempt to limit the growth of Paris by prohibiting the erection of new buildings beyond certain bounds was begun in

---

[1] No. 6 in the Seventh Series of "Health Lectures for the People," delivered under the auspices of the Edinburgh Health Society, 1886.

1549, and renewed from time to time down to 1672, when Louis XIV. justified his edict by the following reasons:—"(1) That by enlarging the city, the air would be rendered unwholesome. (2) That cleaning the streets would prove a great additional labour. (3) That adding to the number of inhabitants would raise the price of provisions, of labour, and of manufactures. (4) That ground would be covered with buildings instead of corn, which might hazard a scarcity. (5) *That the country would be depopulated by the desire that people have to resort to the capital.* (6) That the difficulty of governing such numbers would be an encouragement to robbery and murder."

Queen Elizabeth prefaced her proclamation issued in 1602, prohibiting the erection of new buildings within three miles of London, with the following preamble:—"That foreseeing the great and manifold inconveniences and mischiefs which daily grow, and are likely to increase, in the city and suburbs of London, by confluence of people to inhabit the same; not only by reason that such multitudes can hardly be governed, to serve God and obey Her Majesty, without constituting an addition of new officers, and enlarging their authority; but also can hardly be provided of food and other necessaries at a reasonable price; and finally, that as such multitudes of people, many of them poor, who must live by begging or worse means, *are heaped up together, and in a sort smothered with many children and servants in one house or small tenement;* it must needs follow, if any plague or other universal sickness come among them, that it would presently spread through the whole city and confines, and also into all parts of the realm."

Such were the dangers and disadvantages of large cities as they appeared to the rulers of those distant centuries. Some of them, and notably those of government and food supply, have in the interval been fairly met or even overcome by improved local administration, the repeal of the corn-laws, and greater facilities in transport and distribution. The standard of health of cities has also been enormously advanced, but it is still true that the rural districts are being depopulated to maintain the towns, that the inhabitants of towns are, in the words of Queen Elizabeth, "heaped up together, and in a sort smothered with many children" in small tenements, and that towns are, though much improved, unwholesome as compared with the rural districts from which their active, reproductive population is drafted.

Let me now try to put before you as concisely and simply as may be some information as to the growth of towns in Great Britain, as to the manner of this growth and the vital characteristics of a town as compared with a country population.

In doing so I shall state nothing which is not capable of proof by actual statistics, but remembering how difficult it is to make figures popular, I shall use them as sparingly as possible.

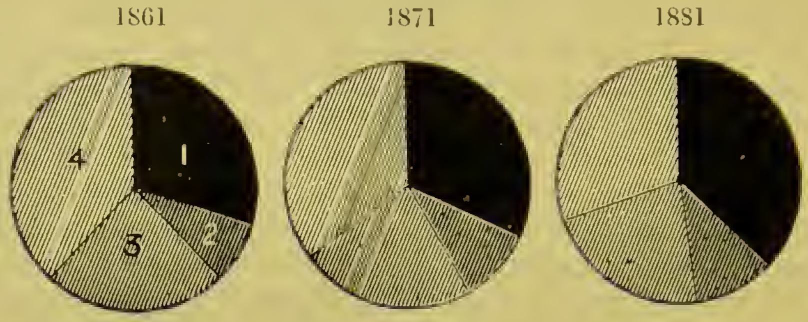
In this country, Government, to use a commercial phrase, takes stock every ten years. In England the whole country is divided into Sanitary Districts, which are classified as Urban or Rural according as, from the density of the inhabitants, they require more or less stringent sanitary provisions. In 1861 it was found that 63 per cent. of the entire population of England lived under Urban conditions, in 1871 this proportion had risen to 66, in 1881 to 68, and in 1891[1] to 72 per cent. In other words, in 1861 there were 172 dwellers in towns to 100 dwellers in rural districts; but in 1871 the number had risen to 192, in 1881 to 212, and in 1891 to 254. The growth of London has been so extraordinary, we may say portentous, that it deserves a special reference. In 1801 it was found that out of every 100 of the entire population of England eleven were inhabitants of London, and this proportion has advanced steadily with every census until in 1891 between 19 and 20 in every hundred were aggregated in "Greater London."

In Scotland we have no such sub-division of the country into districts on the basis of their sanitary requirements; but the Registrar-General classifies the population according as they live in principal, large or small towns, or in mainland-rural or insular-rural districts. This will equally well serve our purpose. In 1861 we find that 61 per cent. of the entire population of Scotland lived in towns; in 1871 the proportion had risen to 65, in 1881 to 69, and in 1891 to 73 per cent. You will observe that the absorption of the rural population into towns is advancing more rapidly in Scotland than in England; and the fact assumes more importance than is at first apparent, when we remark that it is into the eight principal towns that the population is flowing. While the proportion of the people found at each census in the smaller towns and villages was falling off, the proportion found in the chief towns was rising from 29 per cent. in 1861 to 32 in 1871, 38 in 1881, and 39 in 1891. Glasgow is devouring the population of Scotland even more rapidly than London that of England. At the census of 1871 we find in Glasgow and its suburbs no less than 17 per cent. of the inhabitants of all Scotland; in 1881 this proportion had risen to 18, and in 1891 to 20 per cent., so that the western metropolis of Scotland has collected about her a greater proportion of the inhabitants of that kingdom than London has of the inhabitants of England.

---

[1] This and subsequent references to the 1891 Census were added to the original paper as they became known.—[Ed.]

Distribution of Population of Scotland in Town and Rural Districts.



(1) Principal, (2) Large, (3) Small, Towns. (4) Rural Districts.

If we look more closely at a town as compared with a rural population, we discover various characteristic features which it is of interest and importance for us to note. There is always in towns a much greater proportion of adults of both sexes, persons at the prime of life. The marriageable females are greatly in excess of the males of the same age. As a natural consequence, early marriages are much more frequent in the towns than in the rural districts, the birth-rate is higher, and the proportion of children under five years of age is in excess. But between five and fifteen years of age the proportion is reversed. Though the town population is more productive, it is less conservative of child-life than the rural population. Another equally sinister characteristic of a town population is that, while above forty-five in country districts, the proportion of persons still living in the married state is maintained, even to extreme old age; in the towns it falls off in comparison, and is replaced by a large excess of widows and widowers.

If we inquire where towns-people were born, we discover that a very large number, amounting in the larger towns to one-half, are not natives of the town. They hail from agricultural districts and villages. Their speech shows every variety of provincial dialect. In manufacturing towns, and among the unskilled labourers everywhere, we recognize a strong Irish element. If we single out the adults, the persons who are engaged in the workshops, factories, warehouses, who are bustling about the streets in the full vigour of life, we find that a very small proportion, perhaps a third only, belongs to the town, while among the children and the adolescents the relation is reversed, a third being strangers, which still, however, indicates a large admixture of outlandish blood.

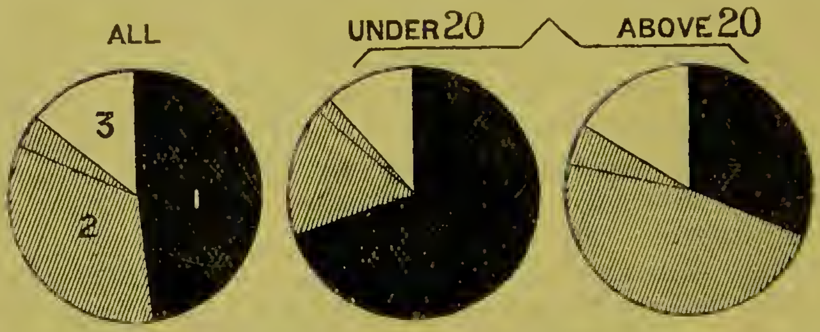
Such is a general statement of the comparative composition of a town and a country population, if we contrast them at any one period of time. These differences are the final outcome of all the vital movements which are progressing from day to day and from year to year—migrations of families and individuals, guided by every variety of motive, from town to country and from country to town, over the face of the land, and of the balance of births and deaths within the towns and rural districts. It will both interest you, and expose more clearly to your apprehension the nature and extent of those vital movements, if we take a rapid glance over broad Scotland in the interval of ten years between 1881 and 1891, and endeavour to illustrate the process which throughout the kingdom is resulting in the gradual absorption of the population within the limits of towns.

There are only two ways of exit from the ranks of the inhabitants of a district, whether it be urban or rural—by death or by *e*-migration. There are only two ways of entrance—by birth or by *im*-migration. If, therefore, we find that the population living within any fixed boundary has *increased* by more than the surplus of births over deaths, or in spite of an excess of deaths over births, then there must have been *im*-migration within that boundary from the outside. If, on the other hand, we find that the population has *diminished* by more than the excess of deaths over births, or in spite of a surplus of births, then there must have been *e*-migration outside the boundary from within. The universal experience is, that towns are growing in excess of their surplus births, and that rural districts are diminishing in spite of an enormous surplus of births. Therefore, we are shut up to the conclusion that there is a continual migration from the latter to the former. Take further into consideration this fact—that both the death-rate and the birth-rate of towns are much higher than the death-rate and birth-rate of the rural districts, and I ask you, is it pronouncing a harsh judgment upon the towns to say that they devour their own children and fill their empty places with the children of the rural districts?

But I am departing from my proposed illustration from the case of Scotland. I shall take the average results of the ten years, 1881 to 1891. The eight *principal towns*, all having above 25,000 inhabitants, had an annual excess of births over deaths of 18,744, but they increased by 21,760 souls every year, so that they absorbed every year 8420 *im*-migrants. Their average birth-rate was 33 and their death-rate 23 per 1000 inhabitants. The *large towns*, all having from 10,000 to 25,000 inhabitants, had an annual excess of births over deaths of 6240, but they increased by 11,871 souls every year, so that they absorbed every year 5631 *im*-migrants. Their average birth-rate was 33.5 and their death-rate 19 per 1000 inhabitants. The *small towns*, all having from 2000 to 10,000 inhabitants, had an annual excess of births over deaths of 11,643, but they only increased by 6185 souls, so that they sent out an annual surplus of 5458 persons. Their average birth-rate was 33, and their death-rate only 18.4 per 1000 inhabitants. The *rural districts* had an annual excess of births over deaths of no less than 14,207, but they actually *decreased* in population at the rate of 6220 per annum, so that they sent out a surplus population of 20,427 persons every year. Their average birth-rate was 28.4 and their death-rate 16 per 1000 inhabitants.

Although these figures seem very simple, they, in reality, represent the final result of very complex social movements, which, if followed out, would lead us into nothing less than a statistical analysis of the population of the habitable globe, including even the Scotchman, who is said to be sitting on the top of the North Pole! When we strike the balance of births and deaths over all Scotland, and compare the absolute increase of the population of all Scotland in those ten years, we find that over 218,274 persons must have left the country altogether; joined the great army of Scotch invaders of England, or emigrated to the Colonies or elsewhere. Then we have also to remember the steady influx from Ireland. Nor are the movements between town and country all one way. There are counter-currents from the town to the country, which become specially active in times of commercial depression. But we need not complicate our thoughts with these phenomena. They are all subordinate to the general law, which is the transference of an increasing proportion of the whole population, from the conditions of life in the country to the vastly different conditions of life in the town. I wish you to have a clear understanding of the final result of all this interchange of people, of birth and death and migration, upon what may be called the statical condition of a town. This gives us the practical result, which will form the text of the remainder of my lecture; and, for this purpose, if I may venture to trouble you with a few more figures, we may take Edinburgh

PROPORTION OF NATIVES AND IMMIGRANTS IN EDINBURGH—1881.

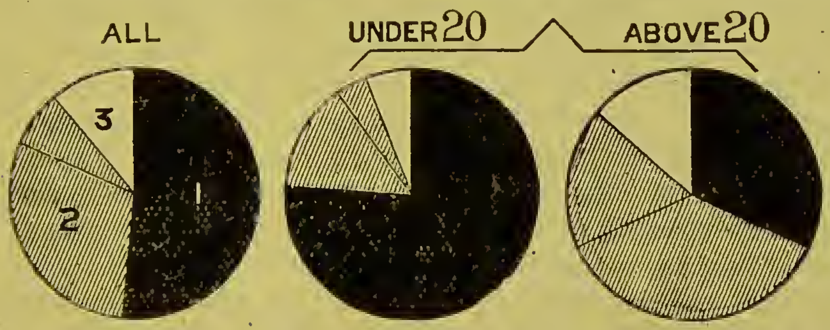


(1) Natives. (2) Rural Districts, the Irish element indicated by small segment. (3) Born in seven towns and elsewhere.

and Glasgow. What was the composition as to birth-place of the inhabitants of those cities as they were in 1891, after all the complex movements of the past centuries had passed over them?

The growth of Edinburgh during the ten years preceding last census was supplemented by an annual draft from external sources of 152 persons, over and above her own birth-product. In 1891, out of every 100 of her inhabitants, only 51 were natives; 32 had been born in the counties of Scotland, exclusive of the seven principal towns; 7 had migrated from their birth-place in those towns; 5 had come from across the Border; and only 3 were of Irish origin; leaving a balance of 2 contributed from outlandish sources. If we divide the inhabitants of Edinburgh into two classes, one consisting of persons under twenty years of age, and the other of persons aged twenty years and upwards, and then contrast the birth origin of these two classes, we get the following interesting and instructive result. We shall call the younger class the *adolescents* and the older the *adults*. Of the Adolescents 72 out of every 100 were natives of Edinburgh, of the adults only 35½; of the adolescents only 16½ hailed from the counties of Scotland outside the seven principal towns, of the adults 44; of the adolescents 6 had migrated from those towns, 3 were of English origin, and only 1 of Irish, as compared with 8, 6½, and 4 respectively among the adults, leaving a balance of 1½ adolescents and 2 adults derived from outlandish sources.

PROPORTION OF NATIVES AND IMMIGRANTS IN GLASGOW—1881.



(1) Natives. (2) Rural Districts, the Irish element indicated by small segment.
(3) Born in seven towns and elsewhere.

In the case of Glasgow it is necessary to include the suburbs to get a true measure of the indebtedness of the entire community to external sources for the increase of its population. We then find that her own birth-product was supplemented by an annual draft of 1041 persons. In the decade preceding it was 2340. The materials for an analysis of the inhabitants of Glasgow and suburbs as to their place of birth are not accessible to me. I must therefore take so much of this great community as is included in Glasgow as extended in November, 1891. In 1891, out of every 100 of the population of this "Glasgow," only 53 were natives, 27 came from the counties of Scotland outside the seven principal towns, 10 were natives of Ireland, 5 came from the other chief towns, 4 were of southern origin, leaving 1 to represent the foreign element. As in the case of Edinburgh, if we separate the inhabitants of "Glasgow" into "adolescents" and "adults," we find that out of every 100 of each class among the adolescents there were 73 Glasgowegians, among the adults only 37; among the adolescents only 18 hailed from the Scotch counties, exclusive of the principal towns, among the adults 35; among the adolescents only 2½ were of Irish origin, among the adults, 16; while of the former class 3 were natives of the chief towns, and 1½ were from over the Border, as compared with 6 and 5 respectively of the latter class, leaving in each case a balance of 1 foreigner to complete the 100.

These are fair samples of the results of the family management of towns. If we turn up their register of births from year to year, we find them overflowing; but when we call upon them at the census we find that half of the family are changelings. In that chapter of his quoted at the outset of this lecture, Lord Kames remarks, contemplating the comparatively modest requirements of London a century ago:—"The annual supply amounts probably to a greater number than were needed annually for recruiting our armies and navies in the late war with France. If so, London is a greater enemy to population than a bloody war would be, supposing it even to be perpetual. What an enormous tax is Great Britain thus subjected to for supporting her capital! The rearing and educating yearly for London 7000 or 8000 persons requires an immense sum." In 1865 Dr. Morgan, in a paper on "The Deterioration of Race in Large Cities," estimated that in order to maintain the growth of London "the whole available resources of a vast country nursery, peopled by nearly two millions, must be called into requisition."

Observe I do not find fault with the towns for attracting "young rusticity," or young rusticity for being attracted. There are natural and insuperable limits to the number of people who can live upon the soil which they cultivate. In all ages a time has come sooner or later when, those limits having been reached, the surplus population has, in the search for subsistence, forced its way into "fresh fields and pastures new." The boy,

> "When first he leaves his father's field,
> And at night along the dusky highway near and nearer drawn,
> Sees in heaven the light of London flaring like a dreary dawn,
> And his spirit leaps within him to be gone before him then,
> Underneath the light he looks at, in among the throngs of men;"

this boy is but a drop in the great tide of men, which flows peacefully to many shores under the same impulse which hurled the surplus hordes of the crowded north in a raging sea down upon the Roman Empire and overwhelmed it. I do not complain of the continued operation of this natural law. It is futile to oppose it, as those sovereigns tried to do by edicts and ordinances. What I do protest against as a great national injury is that the towns do not rear their own children into healthy and vigorous citizens, competent to supply some larger proportion of their wants. They receive those selected lives, reared by the parental care of rural districts, aided by favouring physical conditions, and they subject them to physical conditions which are fatal to child-life, and slowly sap the vigorous rustic constitutions of the parents. Look at those circles exhibiting at each successive census the proportions of the whole population of Scotland living under the conditions of town and country life, where black in three shades represents the towns in their three grades of size, and green stands appropriately for the country.[1] Observe how the black is steadily spreading and the green retiring before the inroads of the black. Remember that the birth-rate is much higher in the towns than in the rural districts, and that consequently the proportion of the total birth-crop of the nation, which is exposed to the adverse influences of towns, is larger than the black represents, and the proportion springing up under the benign conditions of rural districts less than the green represents. Now endeavour to estimate the gravity of this ever-advancing revolution in the vital constitution of the nation by its results on child-life. Speaking of Scotland as represented in those diagrams, as the black extends you have a condition of things extending, in which, of every 1000 children born, 130 die before they have reached their first birth-day. As the green diminishes, you have a condition of things diminishing, under which only 87 are thus prematurely cut off. But the deepest shade of black, the largest towns, is steadily absorbing a larger proportion of the dark area, and this means the extension of conditions under which 140 out of every 1000 children born perish within a year of birth. Glasgow is extending most rapidly of all, and she makes away with 147 per 1000 of her children before she has had them a year in her fatal arms. Scotland is but a small item in the United Kingdom. Her whole population is less than that of London, and only constitutes between one-ninth and one-tenth of the United Kingdom. A much larger proportion of the English than of the Scotch people live in large towns, and the large towns of

---

[1] See page 304, where the diagram referred to is reproduced, with shading instead of colouring.

England are much more deadly to child-life than those of Scotland. Within a year of birth they destroy on an average 162 of every 1000 born. If we take individual towns, the sacrifice is still more dreadful. For example, in Liverpool it is 183 out of every 1000 born, in Leicester it is 202, and in Preston it is 222, that is to say, one out of every four or five of the unhappy babies of Preston is buried within twelve months of its birth.

You know that in war when you read that so many were killed, you always read further that so many were wounded. You do not need to be told that of the wounded many more will die, and that the majority of those who ultimately survive will be more or less maimed and crippled, and a large proportion will be invalided and found unfit for further service. So it is with those troops of children. If 130, or 147, or 162, or 222, in four several troops of 1000 each, have died within one year of their entrance upon the campaign of life, then a proportion keeping pace with the rising fatality will be wounded. Of these many more will die as the campaign progresses, and the survivors will be invalided and found unfit for further service. Still further, if only 87 have died in another troop, you need not be told that the physique of those who survive must on the whole be more vigorous and serviceable than the physique of the survivors of those other thousands. I reason thus to lead you to the conviction, without appealing to the comparative statistics of stature, rate of growth, weight, chest-girth, and all those facts of anthropometry or man-measurement, that it cannot but be that the physique of town born and bred men and women is inferior to that of men and women born and bred in the country. This being admitted, if the proportion of all the children of a nation who are town born is increasing from year to year, then the physique of the whole country must be deteriorating in quality. The rural districts furnish the only resistance to our progress down the inclined plane, and just as the towns absorb the inhabitants of the rural districts, this resistance will become less, and the national descent more rapid.

Now, you know what I mean by " The Children of the City." and you can estimate the importance of my question :—" What can we do for them?"

I must endeavour to work out for my remarks some limiting lines derived from the characteristics of the child as contrasted with the man, otherwise I shall be led into a general disquisition upon health and the whole round of sanitation. I confine myself mainly to the physical aspects of childhood. The child has to grow the machine which as an adult it will use. In the first year of life, the child adds more to its bulk than in any subsequent year. It trebles its weight, and adds 7¾ inches or 41 per cent. to its height. In the second year it gains nearly 4 inches more, and so by gradually diminishing increments attains "the full stature of the perfect man." It follows from these facts that every element of health which influences the adult tells much more upon the child either for good or ill. The adult is in a position of stability, and has mainly to strive to keep what he has got, to resist deterioration. The child has not merely to resist but to store up. It must move on or it will die. The child is physically, even more than morally, the father of the man. It may change morally, but it cannot get rid of ricketty bones, or impaired organs, or a tainted constitution. If it gets insufficient or improper food to eat, foul air to breathe, impure water to drink; if it is cramped in space and cradled in dirt, it cannot help itself. It must succumb or grow up through sickly and unhappy adolescence into weak and stunted manhood. This helplessness is one of the pathetic features of childhood, which should touch the heart of society on its behalf. No moral blame attaches to it for the circumstances and surroundings into which it is born. The child's sufferings are vicarious—if for sins and shortcomings, they are not its own. The element of discipline which enters so largely into the physical conditions of the adult life, and makes the thoughtful philanthropist hesitate in his work of relief and amelioration, has no place in our dealings with childhood. As regards pure air, pure water, cleanliness in all its details, nothing more need be said than that the child enjoys the largest share of the blessings which descend upon the community which is well cared for in these respects. The general sanitary improvement of our towns tells first and chiefly upon the children. So also with everything affecting the morals of the adult population. Vice and drunkenness strike at the child through the physical deterioration of the home, and the destruction of that self-denying and scrupulously conscientious discharge of parental responsibility upon which the weak and helpless child is so utterly dependent. The city quickens every element, the bad as well as the good, in human nature. So if we find there more culture, more moral earnestness and elevation, more intense religious life, more philanthropy, more political fervour than in the country, we also find there more vice, more crime, more self-indulgence, more modern heathenism, more political and social quackery. At the root of a high infantile death-rate, there are always elements of moral delinquency in the parents, and drunkenness is unquestionably the most potent for evil of all the moral factors. It devours the material necessaries of child-life by diverting the money which should provide food, clothing, education, air-space in the house, to the tills of the publican. It transforms the kindly, self-denying father into a selfish, heartless brute. It impairs the constitution of the child before it has entered the world. It taints the mother's milk after the child is born, and deprives it of all the tender nurture which instinct secures for the offspring of even the inferior animals. This is all I intend to say of the morals of this complicated question of child-life in cities. I feel bound to say so much simply to show that I am alive to their existence and importance. It is a favourite method of landlords and others, whose material interests are affected by the arguments of those who advocate the improvement of the physical conditions of life in cities, to divert attention from one of the many causes at work which happens specially to touch their pockets, to another cause which somehow or other always has this feature to commend it—that it shifts the burden from their shoulders. It is also a failing of one-eyed though zealous social reformers to magnify their particular fad, and so aid and abet, it may be unwittingly, the numerous class of interested obstructives. They join heartily in any cry of " lo! here," " lo! there," as the most likely way to secure that nothing at all will be done, and so their interest will be conserved.

Let us assume, then, that a city child has parents who are sober, industrious, honestly desirous to do their best in the circumstances in which they are placed, to rear it. Let us also assume that it has been born in a city which has a good water-supply, which is well-drained and sewered, and, on the whole, as cities now-a-days are, fairly well looked after as to general sanitation. If I were asked to express in one word what it is that the city child still lacks which the country child possesses, and what it is that the child as a child, wherever it may live, most requires, I should reply, " Space," or the Anglo-Saxon equivalent, " Room." So soon as men cease to use that portion of the surface of the earth on which they reside for the production of their food, they are relieved from the necessity of distributing themselves over the surface. Instead of farms and crofts and cottars' houses, with intervening fields and roads, we have villages, towns, and cities with only so much bare space left in them as is necessary for inter-communication by narrow lanes and streets. The relation of space to people is regulated not by agricultural necessities, but by competition for living and working-room upon it. The larger the city the hotter grows this competition. It is hottest in the heart of it, where house is piled upon house, and tenement crushed in upon tenement, and ever the less becomes the proportion of space per inhabitant, and the scantier the access of the air and the sunlight. The fields fly further and further away from the advancing Medusa of the city, whose look turns them into stone.

This element of space comprehends all the physical conditions of health so completely that, under the name "density," it is recognised by vital statisticians as the best standard of measurement of those conditions in different districts for comparative purposes. It may be variously expressed. The population divided by the superficial area in acres upon which they live, gives the number of persons per acre—which is 56 in Glasgow, and may be any fraction of a person in a rural district. The opposite calculation gives the fraction of space per person—which is the fifty-sixth part of an acre, or about 86 square yards in Glasgow, and may be many acres in a rural district. Another interesting expression of the same facts is got by supposing each man, woman, and child to stand in the middle of his or her own plot. How near would they be to one another? This is called the "proximity," and in Glasgow the distance would be 10 yards, while in a rural district it might be ten or twenty times as far. But it is the house-space which is of most importance to the child, and most of all in a city where the space outside the house is so restricted. It does not matter much to the country child whether it resides in a mansion or in a sheiling with a "but and a ben," or even in a "but" without the "ben." Outside there is boundless space. The cottar's wife can carry her baby over the threshold with the certainty of seeing the sun, and giving it a bath of pure air. The cottar's three-year-old can toddle over the grass and fill its hands with daisies, and the school-boy can run and leap for miles. But the town child finds no such compensation outside the one-room house. Therefore this aspect of density is the most serious of all from our present point of view. Again turning to Glasgow for illustration, we find that the average size of the Glasgow house is only between two and three rooms, and that every room is occupied by an average of about two people. Of every hundred persons living in Glasgow,[1] eighteen reside in a one-room house. There it is found that the smaller the house, reckoning size by rooms, the more people occupy it in proportion to the cubic air-space within. In large houses, therefore, space is a luxury. It is in excess of the requirements of health. In the small houses, on the other hand, it is pinched and reduced below those requirements. It is like insufficient food or clothing, a manifestation of straitened circumstances, or of thoughtlessly distributed expenditure.

It is necessary for scientific purposes to be able to express the facts of density, so far as measureable, by such figures; but while I feel that it is not necessary to tell you that there is only a fraction of a person per acre in a rural district to enable you to understand the healthy conditions which there prevail, I am painfully aware that to tell you of the average fifty-six persons per acre in a city makes you little the wiser. Even when I add that eighteen per cent. of these persons live in a one-room house, there is still something wanted to give you some conception of the disadvantages of child-life in such conditions. Let me try to help you to fill in a few corners of the picture, for I make no reference to the disease, the moral contamination which spring from these conditions, but only to some special uses of space which are indispensable to childhood.

---

[1] That is in "Old Glasgow." The previous figures refer to "Greater Glasgow" as extended in 1891. As the extension took effect *after* the census it was not possible to obtain data so detailed regarding the new as regarding the old city.

Some of you may have read a clever little book called "Ginx's Baby, his birth, and his other misfortunes," and if so, you cannot have forgot the circumstances of space in which this baby, the twelfth of its name, found itself. "The dimensions of the bed were 4 feet 6 inches by 6 feet. When Ginx, who was a stout navvy, and Mrs. Ginx, who was, you may conceive, a matronly woman, were in it, there was little vacant space about them. Yet as they were forced to find resting-places for all the children, it not seldom happened that at least one infant was perilously wedged between the parental bodies; and latterly they had been so pressed for room in the household that two younglings were nestled at the foot of the bed. . . . The family sleeping-room measured 13 feet 6 inches by 14 feet. Opening out of this was their kitchen and sitting-room; it was not quite so large as the other. This room contained a press, an old chest of drawers, a wooden box once used for navvy's tools, three chairs, a stool, and some cooking utensils. When, therefore, one little Ginx had curled himself up under a blanket on the box, and three more had slipped beneath a tattered piece of carpet under the table, there still remained five little bodies to be bedded. For them an old straw mattress, limp enough to be rolled up and thrust under the bed, was at night extended on the floor. With this and a patchwork quilt, the five were left to pack themselves together as best they could. So that, if Ginx, in some vision of the night happened to be angered, and struck out his legs in navvy fashion, it sometimes came to pass that a couple of children tumbled upon the mass of infantile humanity below."

The only detail of this graphic picture which is not true to nature is that all those twelve children survived. In real life, at least half of them would have been laid to rest in the churchyard, for there is nothing more striking in one's experiences of visiting such localities than the uniform tale of large families and high mortality—ten, twelve, fourteen, or more children, and only two or three alive. Mr. Ginx was a labourer, earning 18s. to 20s. per week, and living in London. In Glasgow he would have occupied a one or two apartment house in a back land, up several flights of stairs, at the end of a dark lobby. There young Ginx would lie, his first breath, like every subsequent one, filling his lungs with the foul air of a crowded and not very clean house. By and bye he would get an airing, in the shape of a promenade in the arms of his little sister, through the back court, a sunless pit, full of the smoke of washing-houses and the smells of ashpits. As soon as she got tired or felt anxious for a little independent diversion she would deposit him on the steps of some convenient stair, or on the shivery asphalte. At other times Mrs. Ginx would take him out shopping, having first carefully locked the others in, generally on the Saturday nights, in all weathers, and perhaps from certain difficulties in the way of getting Mr. Ginx home, returning very late. The nearest place where she could find a sunlit space with trees and grass and some approach to fresh air is a public park a mile or two off, but Mrs. Ginx cannot leave the others, and she is unable to carry or pilot them through crowded streets so far, even if she has not lost all notion of the use of such a trouble, which is very likely. The outcome of the whole situation is that baby is scarcely ever out of that stuffy room. When he begins to creep about, he is constantly in the way, and is either put up on the bed to keep him out of the risk of being scalded or burned or trodden upon, or is sent out with his little nursemaid sister to look at the shop windows, or be planted down in his familiar back court, where he may be seen, like that other child seen by Aurora Leigh on the "uneven pavement" of St. Margaret's Court—

> "Whose wasted right hand gambled 'gainst his left,
> With an old brass button in a blot of sun."

Those restless movements of the tiny hands and feet which are so troublesome in the small house and must be restrained, are the first manifestations of that instinctive craving for exercise which characterizes all young animals. They are essential for the proper development of the body, and ought to be encouraged. As intelligence grows and as the child obtains more and more command over its body, this instinct expands into the desire to play. Then begin, for all the tribe of Ginx, troubles which thicken the further they advance into boyhood and girlhood. If you wish to understand the position of play in the physical, mental, and moral development of the child, you must read a little book, admirable alike for its wisdom and gentleness—"What is Play?" by Dr. Strachan, published in this city some years ago. Play he defines as "All voluntary exercise in the young, prompted by natural inclination and producing pleasure." He points out that the desire to play is an instinct implanted in the child as in other young animals, "to secure in the young the exercise required for development, just as the appetite for food is intended to secure proper nourishment." In short, play is essential for the health and duly proportioned growth of the child. It is that which makes the man and woman, who no longer desire to play, but are impelled by the exigencies of life to maintain by useful work the physique of which the foundations were laid in play.

In this aspect of play consider the position of our city children. They are impelled by a restless, ceaseless instinct, and not by the Devil, as the landlords and the police seem to think. Pent up in common stairs and in back courts, without a bit of space which they can call their own, their play inevitably becomes in great part mischief. What can a poor boy do but pull bricks out of the walls of the ashpit to build houses with, or climb upon its roof and tear the slates off to make traps for the city sparrows? If they fly kites the policeman cuts the string : if they dig holes in the court to play at marbles, the factor denounces them to the police : if they play ball against the wall, the policeman grabs the ball : if they make slides on the pavement, he puts salt upon them : if they try to swim in the river, they are almost poisoned by the sewage, and when they come out it is to find the man in blue waiting for them beside their clothes : if they pitch a wicket on an empty building site, the birl of the well-known whistle stops the game before they have completed their innings. The girls are no better off. As you feel your way along the dark lobbies, blinded by the light you have just left behind you, you stumble over them playing at houses. As you ascend the stairs you have to pick your way through their assortment of broken dishes and odds and ends with which they are reproducing their meagre experiences of house-keeping and shopping.

A philosophic induction made by Dr. Strachan is well illustrated in the city child. He says :—"In all cases the prevailing characteristics of play correspond with the peculiarities of manners, habits, occupations, and pursuits which characterize the adult population." How often do we see the city child playing at being drunk, or at policemen and thieves, or fighting as their elders do. In short, I know of nothing more pitiful among all the pitiful results of want of space upon city life than this compulsory perversion of a natural instinct into unwholesome ways. It has a positive and a negative aspect. In so far as the instinct is gratified it results in the acquisition of destructive habits, and in moral and physical contamination. In so far as it is repressed it robs the child of the proper fruits of a God-given instinct—the development of healthy bodies, predisposed for useful work; a sprightly, manly disposition and an active mind. As the child passes into the youth, what can we expect from such a childhood but a breed of "loafers" and "muffs"! When the child becomes the half-timer and the apprentice, and play assumes the higher form of recreation or renewal and restoration of body and mind by the substitution of sport for daily toil, the city affords no more facility. Their poor pence cannot afford the lease of a field for cricket or football. What can a poor lad do but stand at the close mouth, with his hands in his pockets, smoking or chewing tobacco, talking obscenity, and ready for the dram-shop and the singing-saloon? Need we be surprised that when they become men, they think the best way to enjoy a holiday is to start for a sail or a run by train to some seaside resort or country place, each with a bottle of whiskey in his pocket; or that the arrival of an "excursion" from the city is looked upon with alarm by the inhabitants of our villas and marine palaces?

"What can we do for them?" First, let me say, you can do much for yourselves. Every facility for locomotion—the tram, the suburban train—makes it less a sacrifice of personal convenience for the toiling fathers to choose a house as far afield as possible. I advise working-men to live as far from the heart of the city as they can, but I wish specially to speak of what can be done by public effort after you have done your best to help yourselves. Here the philanthropist is met by his familiar bewildering difficulty. Life is fleeting. There are human beings *now* undergoing hardships, suffering from abuses. Can nothing be done to ameliorate on the one hand, while on the other the radical cure is being patiently worked out? This question must be put with peculiar urgency in reference to everything which affects the welfare of children. Their childhood is passing rapidly away. Every year it ends for some of them. But there are some things which can be done at once. We can in various ways bring the children to the country, and do some little bits of good work in the town. The larger task of bringing the country in such measure as is possible into the town involves the revolutionizing of the prevailing principles of laying out and building cities, and the carrying out of improvements in the course of years.

In suggesting ways of bettering the physical conditions of the children of the city, I shall trust very much to that quick perception of the practical necessities of the case which a good cause never fails to secure in a Christian community. I believe that the best way to promote the cure of a social disease is to take pains to convince the public that the disease exists, and to exhibit its precise nature, rather than to attempt to elaborate a detailed plan of treatment. There are already many good souls in all large cities who are in various ways doing their best to bring a little of the sunshine and beauty of God's earth into contact with the lives of the children of the city. I shall not, therefore, pretend to exhaust the resources of benevolence.

I first warmly commend a system of "Holiday Colonies," which, originating in Switzerland ten years ago, has since spread over many of the towns of Germany, Austria, Italy, and has reached even Russia. Those desirous of fuller information will find it in a paper contained in the eleventh volume of the "Literature of the London Health Exhibition of 1884." A local committee is formed, and funds are collected during the winter and spring. The head teachers of the primary schools are requested to furnish lists of the deserving, really poor, weakly but not actually sick children, between seven and fourteen years of age. These are medically examined, and as many selected as the funds admit. They are then assorted, sometimes in large colonies of thirty or forty each under two or three teachers, but more usually in small bands of ten to fifteen under single teachers. Their clothing is supervised by the ladies, and supplemented by gifts where necessary, but only after getting as much out of the parents as possible. Then farm-houses, school-houses, or even small inns are chosen in the open country. The month which constitutes the school holiday is thus spent. Careful observation by weighing and measuring has shown that the improvement in health effected by these outings is not temporary. The selected children continue to gain in height and weight beyond their fellows. Increased quickness of intellect and great moral improvement are also conspicuous. As to the cost, including a honorarium to the teachers in charge, it only amounts to an average of scarcely two shillings per day for each child. I need not remark that any body who can afford it may engage unostentatiously in this good work, by giving a holiday to one or two city children. Indeed it may be said generally that as regards children the limited individual effort has special place and opportunity. They come into the world in families, and the more of the family we preserve in all we do for them the better.[1]

In America, there are in every city numerous organizations under various names, such as the "St. John's Guild" and "Tribune Fresh-Air Fund" in New York, "The Poor Children's Excursions" in Boston, "The Children's Country Week" in Philadelphia, all of which take the children out for longer or shorter periods to the country. In many Transatlantic towns, arrangements exist for giving young children sails on sea or lake during those hot months of summer which blast the infant lives of their population like the hot breath of the Sirocco. Tickets for these sails are usually distributed through the Health Department or the Police, and the mothers accompany the children.

---

[1] The Fresh-Air Fortnight Holiday Scheme in Glasgow began in 1885.—[Ed.]

I mention also the "National Physical Recreation Society for the promotion of Physical Recreation among the Working Classes." Its scope is very wide, embracing facilities for physical exercise both in winter and summer. This society has started a magazine—"The Gymnasium News," in which you will find an ample explanation of its machinery and method of work. I commend it as deserving of hearty support.

I merely refer to the establishment of "Day-nurseries" for the care of infants whose mothers must work for a livelihood, to Kyrle societies, to the utilization of board-school play-grounds, to the throwing open in summer of private gardens and parks, as has been done by the Inns of Court in London, where, under supervision, children are admitted in the evenings; to the hiring of playrooms in poor districts, with toys and material for games, where shelter and amusement may be found in the dreary winter. These notes will serve as hints to the philanthropic, anxious for the opportunity of doing an immediate and lasting bit of good in their day and generation. Every large city should have a society such as the "Metropolitan Public Gardens Association," over which Lord Brabazon presides, to promote and systematise this work in the locality.

The second part of my answer to the question:—"What can we do?" refers to the making of cities more like places where children form part of the population, and are intended to be reared, rather than places which seem to have been laid out by some Board of Bachelors, or Malthusians, or Herods. "It is a pity," says Mr. Kellogg, of New York, "that in the administration of great cities the interests of half their population are so little accounted of. They are managed for adults, for trade, for property-holders. Why should provision not be made for the sports of childhood? Let spaces for fresh air be reclaimed by throwing down the walls of abandoned graveyards and legally obnoxious tenement houses; let them be preserved from the rapacity of commerce and landlords; let them be reserved until they exist in every ward of the town. In them should be malls for children's games, over which policemen should keep guard, not to repress the children's sport, but to warn off querulous and sordid age. Let the children know that they are a recognised constituent of civic life. Respect them that they may respect themselves." It is not easy to reconcile this feature of cities, either with our reason or our humanity. Just think of the pains expended by breeders of stock of every description, from fowls to race-horses, upon special arrangements for the young. The city notion is to pack the adults as closely as possible, and then shake the children down into the chinks. There are paddocks for the young horses and court-yards to the dog-kennels, but the children must run among the feet of the passengers on the pavement or the horses on the street. There is no space they can call their own. They are in the way both inside the house and outside. One cannot but agree with Herbert Spencer when he says :—"Had Gulliver narrated of the Laputans that the men vied with each other in learning how best to rear the offspring of other creatures, and were careless of learning how best to rear their own offspring, he would have paralleled any of the other absurdities he ascribes to them." How is this? Have we not all been children? Are our Members of Parliament and Town Councillors some strange order of beings who sprang like Minerva, full-grown, into life, and had no experience of nurseries, or play-grounds, or cricket fields? It is often argued by the ladies that the unfairness to their sex, which they allege marks many laws passed or tolerated by Parliament, exists because women have no vote, and cannot influence the representation. I am disposed to believe that if women had had a voice in legislation and administration, children would not have been forgotten. But why do the fathers not look to their interests? Did any of you ever ask a municipal candidate, "Will you support a proposal to provide play-grounds for children in this ward?" Have you ever heard the smoke question raised on such an occasion? Do any of your political associations, after scrutinising the votes of your member on the Irish question or Disestablishment, ever think of inquiring why, in Committee on some Police Bill, he voted for the reduction of the free space to be left behind tenements, or of the breadth of new streets? I am in the habit of carefully scanning reports of the "heckling" of candidates at ward meetings and in Parliamentary elections, and I have found questions on every imaginable and unimaginable subject, but not one touching the health of the people. Yet those questions which I have suggested go to the roots of the improvement of cities as nurseries. Wherever the element of space is involved in any proposal for local or national legislation, support that which will give you the most space about your houses. You will always find the landlords and land-owners and speculative builders on the other side. The opposition does not come from the general body of well-to-do ratepayers who have space enough for themselves and their families. Don't allow yourselves to be frightened by the cry of increased taxation. Those who have *pro indiviso* pleasure-grounds and pay enormous feu-duties for them are quite ready to share with you every expense attendant upon the provision of open spaces for your children. Why should you object to contribute your pence or shillings along with their pounds? You will save it in doctors' bills. The cost of burying one child would pay the tax for years. Many who live in large houses and have private grounds would not do so but for the sake of their families. They believe that the best legacy they can leave to their children is not money saved at the expense of house-room, but money invested in their ruddy cheeks, firmly knit limbs, and sound constitution.

One word of warning I venture to utter as to the situation and use of open spaces for city populations. Speaking of a working-man's wife in New York, the writer I have quoted says :—" Had she time she might carry the little one to the open squares of the city; but these are gradually disappearing, and the taxes for public pleasure-grounds and health-giving spaces are consumed upon the vast, distant Park accessible chiefly to those who have leisure or wealth." My warning is that you working men should remember that for you the most useful open spaces are those which are close to your dwellings. Observe I do not object to those distant parks in themselves, but solely as substitutes for the occasional simple playground in the heart of the city. Both together form a complete provision for your young children whenever they can venture out during a sunny hour, as well as for yourselves on Saturday afternoons and holidays when you can go to the park with your families. I fear corporations have hitherto as a rule spent all their rates for open spaces upon these parks, and have chiefly benefited suburban communities of wealthy people who have congregated around them beyond the area of taxation. I praise and commend for imitation by other cities the wisdom of the Corporation of Edinburgh in not only providing parks, but also clearing and paving small areas here and there in the dense portions of the city. There your youngest children can sprawl about in the sunshine, and your older ones enjoy their games. See to it also that even in the distant pleasure-grounds the flower-beds do not usurp all the space, but that vacant areas are left for cricket and football. There your lads, who cannot afford to lease fields like the golden youth of the wealthy, will have the same scope for wholesome recreation. Parks should not be places for merely dawdling along looking at flowers or admiring grass through iron railings.

I suppose many of you have read " Oceana, or England and her Colonies," by James Anthony Froude. You will remember how Mr. Froude uses the facts regarding the progressive absorption of our home population in large cities, and the physical degeneracy consequent upon city life, upon which I have based this lecture. He makes them the foundation of his eloquent denunciation of a policy of separation from, and advocacy of a corporate union with our colonies. He says :—" It is simply impossible that the English men and women of the future generations can equal or approach the famous race that has overspread the globe, if they are to be bred in towns such as Birmingham and Glasgow now are, and to rear their families under the conditions which now prevail in those places. Morally and physically they must and will decline." In the first and last chapters of this book Mr. Froude repeats again and again, with all the vigour and variety of expression of which he is a master, his opinion that our cities can no longer rear men, that our only hope as a nation is in our colonies. " England would pour out among them, year after year, those poor children of hers, now choking in fetid alleys, and relieved of the strain, breathe again fresh air into her own smoke-encrusted lungs." Again he uses a metaphor which, though not true to nature, yet clearly expresses his notion of the function of the colonies in the future life of the nation :—" By and bye, like the spreading branches of the forest tree, they would return the sap which they were gathering into the heart." To avert national extinction, and secure the colonies as the nurseries of the men who are to fight our battles, and preserve our supremacy among the nations, he appeals to the democracy. He says :—" If the colonies are to remain integral parts of Oceana, it will be through the will of the people. To the question, What value are they? the answer is that they enable the British people to increase and multiply." Thus, and thus only, says Mr. Froude, England will remain " Queen among the nations, from without invulnerable, and at peace, and *at health within.*"

Ladies and gentlemen, I also appeal to the democracy, but my appeal is to this effect :—Do not abandon our cities to this black future. How can England ever be " Queen among the nations, from without invulnerable, and at peace and at health within," if the old heart of the nation beats slower from year to year in an island which is being gradually petrified into cities in which children die or grow up into " Dead-sea apes?" By all means incorporate the colonies, but not as healthy limbs to a decaying body. That will not preserve to us our sovereignty. Never will it be truer that the voice of the people is the voice of God than when that voice says—" Let there be light " in those " fetid alleys," where Mr. Froude says, and says truly, " with no sight of a green field, with no knowledge of flowers or forest, the blue heavens themselves dirtied with soot,—amid objects all mean and hideous, with no entertain-ment but the music hall, no pleasure but in the drink shop,—hundreds of thousands of English children are now growing up into men and women." Only say the word, and the light will come. Long before the advent of household suffrage Carlyle told you so. Let his words, repeated now, wake you up to a sense of your power. "Every toiling Manchester, its smoke and soot all burned, ought it not, among so many world-wide conquests, to have a hundred acres or so of free greenfield, with trees on it, conquered, for its little children to disport in; for its all-conquering workers to take a breath of twilight air in? *You* would say so! A willing Legislature *could* say so with effect. A willing Legislature could say very many things! And to whatever 'vested interest,' or such like, stood up, gain-saying merely, 'I shall lose profits,' the willing Legislature would answer, 'Yes, but my sons and daughters will gain health, and life, and a soul.'"

CHAPTER VII.

STUDIES IN EPIDEMIOLOGY.

(1) *Special Methods of dealing with Infectious Diseases and their results.*

In "Evolution" a chronological parallel was established between the introduction of special methods devised to combat particular diseases, and the results which followed.

Typhus Fever had yielded before the combined assaults of hospital isolation of the sick and supervision of the contacts, but most of all to a rigorous application of the power of ticketing small houses and thereby preventing excessive overcrowding.

This disease being well under control by the early 70's, the administration was free to devote its attention to the Infectious Diseases of Children. From 1874 removal to hospital was vigorously pursued, and the control of Infectious Diseases became systematised. In the same year co-operation with the School Board for the purpose of securing early information of absenteeism due to infectious disease was invited and agreed upon. Leaflets were also prepared and issued to every household where infectious disease was occurring, which presented in a popular form the law as then existing for the control of these diseases and a summary of the more obvious methods by which they were spread. With the concurrence of the Registrar-General, a leaflet on the management of children was given to every parent or guardian when registering the birth of a child; and every death registered was made the subject of a special inquiry. Out of the latter there grew a pathological register, in which each death was recorded against the street and number of the tenement in which it occurred.

The cholera experiences of former years had shown that water might, under circumstances of excremental pollution, become a carrier of specific infection, and in 1858 the theory had been applied to the distribution of Enteric Fever in Penrith by milk (Wm. Taylor).[1] Further support to the suggestion was afforded by the Islington outbreak of 1870 (Ballard), and the Leeds cases in 1872 (Robinson), while in 1870 Professor Bell had related a similar association with Scarlet Fever in St. Andrews.

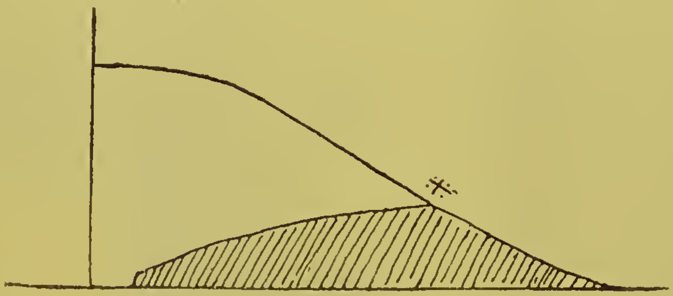
In 1873 an outbreak of Enteric Fever in Parkhead afforded an opportunity of tracing the infection to precedent cases in the dairyman's family, and subsequent outbreaks,[2] referred to in the text (p. 336), were used to show the necessity for reforming the condition of dairy farms in rural districts. The main conclusions were afterwards embodied in a paper on the "Sanitation of Dairy Farms," and helped to mould subsequent legislation for the control of infection by milk.

To the extracts from "Evolution" which follow there have been added:

(1) The History of an Outbreak of Febrile Disease at St. Mary's Roman Catholic Industrial School for Boys, 1888;
(2) The Memorandum on the "Sanitation of Dairy Farms," just referred to; and
(3) A paper on the occurrence of Anthrax among the Workers in a Hair Factory in 1878.—(Ed.)

CRITERION OF SUCCESS IN USE IN HOSPITALS.

In 1883 in a Memorandum on the Hospital Accommodation for Infectious Diseases in Glasgow, which was an attempt to forecast the requirements of Glasgow in hospitals and beds, I said—"Prevention is the aim and the *raison d'être* of hospitals



---

[1] See "Paper on the Dissemination of Zymotic Diseases by Milk," by Dr. John Dougall, *Glasgow Med. Jour.*, Vol. v. (N.S.) 1872-73.

[2] Lack of space, unfortunately, forbids the reproduction of the reports on these outbreaks, but their titles are included in the list of papers appended to the biographical notes, and copies are to be found in library of the Faculty of Physicians and Surgeons, Glasgow.

and sanitary organization; and the evidence of the success of prevention, in so far as isolation is concerned, is and may be formulated as an increasing proportion isolated of a diminishing total quantity of disease existing." Supposing all cases of any infectious disease to be known, then the curve of perfection as regards hospital treatment would be this, in which the proportion removed to hospital is shaded. (See p. 325.)

At the point marked the curve of isolation coincides with the curve of existing disease. They become one; the maximum of bed accommodation is reached. Thenceforth the amount of the disease and the accommodation needed fall together and perfection is reached by the contemporary extinction of both.

SPECIAL METHODS AND RESULTS IN DEALING WITH INFECTIOUS DISEASES.

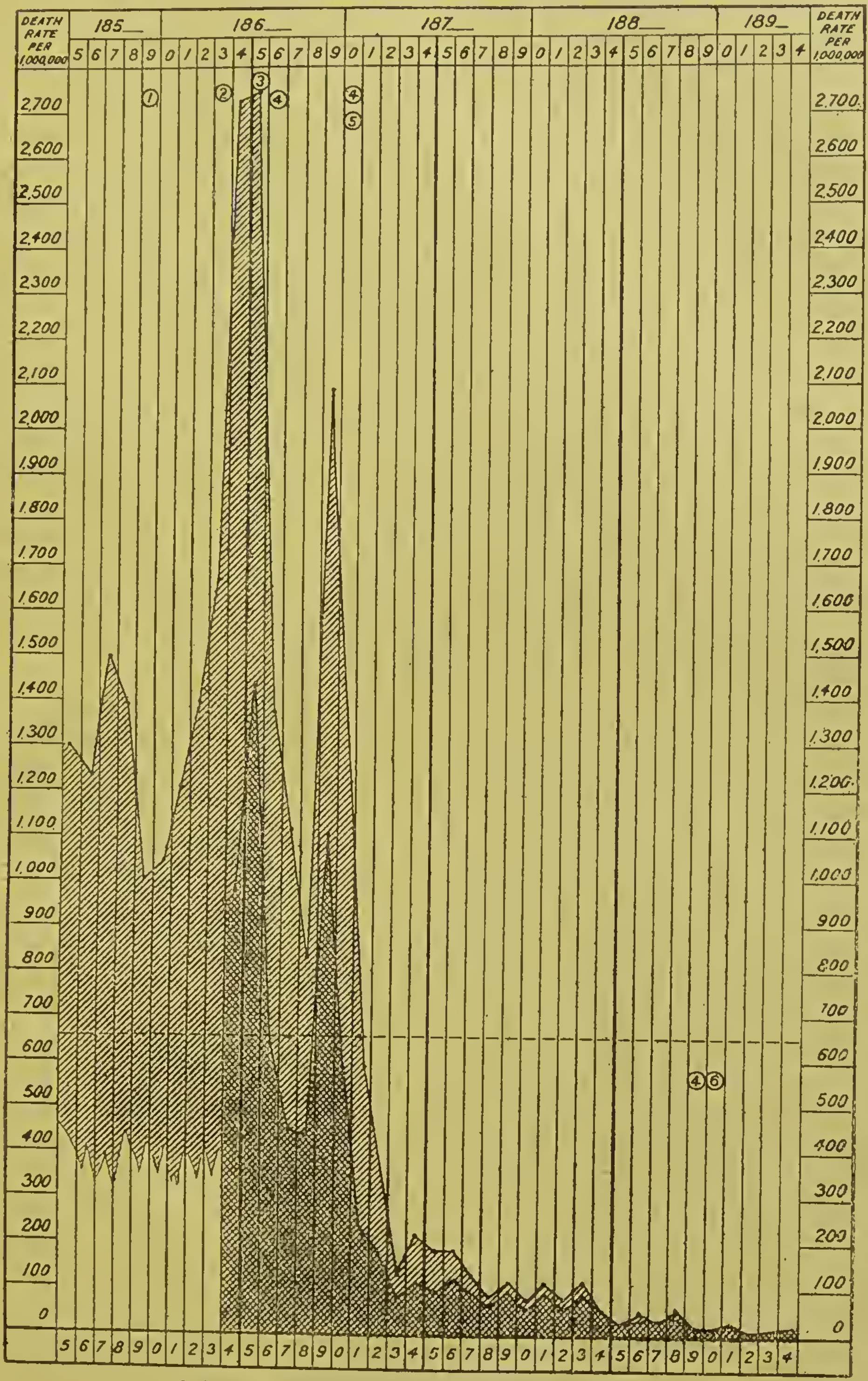
I propose now to consider the chief infectious diseases individually, to bring out any peculiarity in the method of dealing with each and to distinguish in the general bulk of success in prevention the special degree attaching to the treatment of each.

Typhus.—Hospital accommodation was originally provided by the Glasgow municipality solely for the treatment of Typhus. In fact, all the sanitary energy which now-a-days we expend upon the whole fraternity of infectious diseases was 30 years ago concentrated in a death-or-life struggle with this one disease. A "*Fever*-Hospital" or a "*Fever*-shed" meant a place for Typhus and nothing else. The following Table shows the progress of the struggle in quinquennial stages:

Period.	Total Number of Deaths.	No. of Deaths in Hospital.	Death-rate per Million.	Percentage of Total Deaths in Hospital.
1855-59	2333	...	1265	...
1860-64	3225	...	1576	...
1865-69	3607	1795	1623	50
1870-74	1191	583	492	49
1875-79	352	242	140	69
1880-84	194	149	75	77
1885-89	97	77	36	80
1890-94	70	66	23	94

We have only casual opportunities of knowing the proportion of cases treated in Hospital in the earlier pre-registration times.

II. GLASGOW.—Death-rate per Million from TYPHUS for 40 years (1855-94), showing since 1864 the proportion of total Deaths which took place in Hospital.



Mean Death-rate thus - - - - - - - -

Diagram No. II.—Historical References.

(1) Loch Katrine Water turned on. (2) First Medical Officer of Health appointed. Suppression of Overcrowding by ticketing, etc., begun. (3) First Municipal Fever Hospital opened. (4) City Improvements Act passed. Clearances, 1870-77. Re-construction, 1889. (5) Sanitary Department organised. (6) Notification Act adopted.

Dr. Richard Miller,[1] in stating the number of cases which occurred in the 5 years 1827-32 adds that "only about a fourth were sent to any hospital," which is the same proportion as that given by Dr. Cowan for the 5 years 1835-39. We have not attempted to ascertain the proportion of deaths in hospital in the first decade of registration because the duplicate set of Registrar's books in the Sanitary Department only begins in 1865. Still in the figures as given we have a perfect realization of the "curve of perfection" in isolation treatment (see diagram). We begin with 3607 deaths from Typhus in 5 years, of which 50 per cent. took place in hospital, we end with 70 in 5 years of which 94 per cent. took place in hospital. In other words, whereas in 1865, 610 beds were kept full of Typhus and yet more than one half of the total cases were allowed to run their pernicious course at home, for many years now two Wards of 15 beds each or 30 beds in all have sufficed to receive all the cases known to exist in Glasgow. In fact they are often empty for weeks and they are never full. This is an example of the attainment of theoretical perfection in isolation—"the largest proportion isolated of the smallest quantity of disease existing."

This result is not wholly due to the persistent enforcement of isolation. Typhus is peculiar in that its infectivity may, by change of environment, be weakened almost to extinction. Cleanliness and fresh air make it comparatively harmless. Small-pox and Scarlet Fever are not so influenced. Susceptible persons must keep away from them. The deadliest blow struck at Typhus in Glasgow was the suppression of overcrowding. The 1862 Act regulated the occupation not only of Common Lodging-houses but of small private houses. It fixed a minimum size of house which might be inhabited, which led to the closure of hundreds of undersized houses, and it fixed a standard of 300 cubic feet per adult in all houses of a less capacity than 2000 cubic feet.[2] These powers took effect in May, 1863, and Dr. Gairdner at once applied them, beginning with "Binnie's Court" 281 Argyle Street, which was ablaze with Typhus. In this way he followed the Fever about until he had brought all its haunts under night-inspection. Structural alterations to ventilate the lobbies and staircases which penetrated those buildings like tunnels were effected. Very soon he was able to point to notorious tenements remaining free of Fever while elsewhere it prevailed; and in 1866 when

---

[1] "Clinical Lectures on the Contagious Typhus Epidemic in Glasgow and the vicinity during the years 1831 and 1832."

[2] By the 1890 Act, the standard was raised to 400 cubic feet and made applicable to all houses, although "ticketing" and night inspection are still restricted to small houses. [In 1904 the power to ticket was extended to all houses not exceeding 2,600 cubic feet.—Ed.]

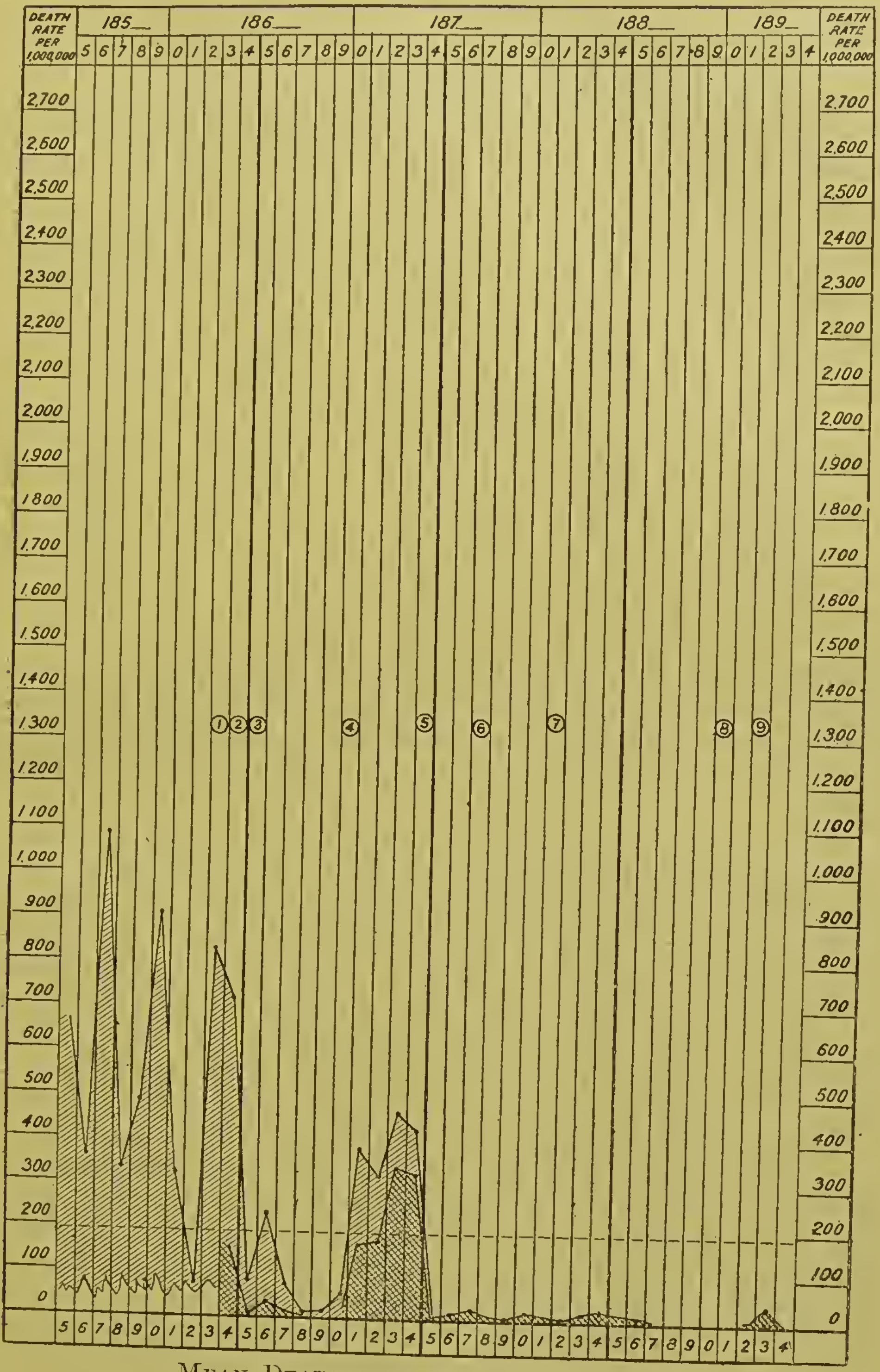
Typhus seemed to be reviving Dr. Gairdner proved by district statistics that its local incidence was in direct proportion to the local overcrowding as shown by the results of the night-inspections. Another thing which is inimical to Typhus is personal and domestic cleanliness. In a Typhus district there will always be more cutaneous excretions on the surface of the skin of the inhabitants and stored in their body and bed clothing than in a district where Typhus is unknown. A Reception House for the well is almost as essential as a hospital for the sick in an infected house. Every inmate of such a house is a magazine of infection, and removal to a temporary refuge is even more necessary for thorough disinfection of clothing than for observation. A Reception House was acquired in 1872, another in 1892. In the case of Typhus the period of detention is 17 days. The practice of free washing of clothes wherever dirt is found in presence of any infectious disease and the steady enforcement of household cleanliness at all times, as well as the facilities afforded by an ample water-supply and baths and wash-houses have raised the standard of domestic cleanliness in the poorest parts of Glasgow to an extent which only those who remember their former state can appreciate.

Small-pox.—Small-pox differs from every other infectious disease in relation to hospital treatment. The Hospital must itself be isolated, and even when this seems to have been effected a Small-pox Hospital may in a manner not yet satisfactorily explained become a centre of epidemic influence. There is no doubt that ignorance of these peculiarities had at one time a deal to do with the propagation of this disease in Glasgow. Indeed, the arrangements at the Royal Infirmary indicated not merely ignorance of this comparatively recondite property of aggregations of Small-pox even when isolated in an entirely separate establishment, but carelessness of the ordinary precautions which every private practitioner would now-a-days think essential to the isolation of a single case. The Small-pox Wards were in the Fever-house, opening off the common stair, in direct structural and unrestricted personal communication with the general hospital, not isolated as to medical attendance, nursing, or management, using the common washing-house, laundry, mortuary, &c., served from the common provision stores, kitchen and dispensary. In such circumstances it need scarcely be said that to send a case of Small-pox to the Royal Infirmary was to plant the disease on wider lines of communication, so that instead of merely spreading in a particular close or wynd, it would spread in a general hospital and be taken out over the city. Hence the exclusion of Small-pox from the Infirmary in 1871 may be regarded as an important step in its prevention; but the treatment of it in Parliamentary Road Hospital was only a partial success although a distinct improvement. Suspicion was soon roused in the mind of the District Medical Officer. In the Spring of 1872 Dr. Gairdner and the Physician-Superintendent after careful inquiry could only report a verdict of "not proven." In the Spring of 1873 Dr. Gairdner's successor reported—"while I am not prepared to say *how* the hospital acts, I am afraid it must be admitted that it does act in propagating the disease in the Northern District." Steps were at once taken to provide a hospital at Belvidere, and it cannot be said that Glasgow ever had the full benefit of isolation in the prevention of Small-pox until 1877 when this hospital was opened. It will now be understood how with reference to the prevention of Small-pox the date of the shutting of a hospital may be as noteworthy as the date of the opening of a hospital with reference to the prevention of Typhus!

The part of Reception Houses in the preventive treatment of Small-pox is quite as important as in the case of Typhus, though somewhat different. Personal uncleanness has no essential relation to Small-pox. Still it is necessary where wardrobes are unknown to get the clothing actually on the bodies of the healthy washed. But the greatest service rendered by a house of temporary refuge arises from the opportunity it gives for the discovery of modified eruptions. Suppose a case of well-marked Small-pox is found in a workman's family—a young person of 20 or 25. There may be from eight to a dozen brothers and sisters graduated in age and all vaccinated more or less successfully. As to existing disease it is impossible to make sure that there is not among them a case or two of Small-pox, modified to the vanishing point of one to a dozen papules, or their remains, unless these persons are stripped and examined by an instructed *official* eye. As to prospective disease, for the same reason, such modified cases springing up under daily official surveillance are sure to be detected, whereas, under ordinary circumstances, they would be concealed even if suspected. Young people naturally kick against confinement in a hospital when in perfect vigour, not to speak of loss of work. For these reasons a Reception House is an indispensable aid in the campaign against Small-pox. Even such limited outbreaks as we are accustomed to in Glasgow tax the accommodation of our two houses, which is ample for all other needs. In Reception Houses as in Hospitals, the motto of Small-pox is *Noli me tangere.* Refugees from Small-pox cannot be put under the same roof as those from any other disease. Typhus is not so touchy.

These results are sufficiently striking without reference to a

III. GLASGOW.—DEATH-RATE PER MILLION FROM SMALL-POX FOR 40 YEARS (1855-94), SHOWING SINCE 1864 THE PROPORTION OF TOTAL DEATHS WHICH TOOK PLACE IN HOSPITAL.



MEAN DEATH-RATE THUS - - - - - - - -

DIAGRAM No. III.—HISTORICAL REFERENCES.

(1) First Medical Officer of Health appointed. (2) Vaccination Act came into force. (3) First Municipal Fever Hospital. (4) Sanitary Department organized. (5) Revaccination by Epidemic Inspectors begun. (6) Permanent Small-pox Hospital opened. (7) Special Enquiry after Vaccination Defaulters begun. (8) Notification Act adopted. (9) Practitioners authorized to revaccinate at public expense persons unable to pay a fee.

standard population. In the 10 pre-sanitation years there were 2197 deaths from Small-pox; in the 30 sanitation years 1060. In the 10 years of imperfect isolation in hospital there were 971 deaths, in the 20 years of perfect isolation 89. There were normally 250 beds in Parliamentary Road Hospital. In March, 1874, we had 258 patients. In the Small-pox Hospital, Belvidere, we have only 150 beds. For the last 18 years the wards there have chiefly been used as a Scarlet Fever annexe to the Fever Hospital, and there have never been more than 106 cases of Small-pox under treatment at one time (in April, 1893).

Period.	Total Number of Deaths.	No. of Deaths in Hospital.	Death-rate per Million.	Percentage of Total Deaths in Hospital.
1855-59	1043	...	565	...
1860-64	1154	...	568	...
1865-69	167	25	76	15
1870-74	804	518	324	65
1875-79	22	16	10	73
1880-84	22	18	8	82
1885-89	8	8	3	100
1890-94	37	34	11	89

Apart from their possibly sinister influence hospitals can at best play only the part of an auxiliary in the campaign against Small-pox. The first line of defence is primary vaccination. Nowhere has advantage been more fully taken of Jenner's great discovery than in Glasgow. So early as 1801 gratuitous vaccination was begun by the Faculty of Physicians and Surgeons, and is to this day continued. In 1857 the Managers of the Royal Infirmary instituted gratuitous vaccination at their dispensary. On 1st January, 1864, the Compulsory Vaccination (Scotland) Act came into force. In 1873 the Local Authority opened their vaccination station. Between these and other stations there is a very large proportion of the primary vaccination of Glasgow carried out officially and therefore in a superior manner. In Scotland the Parochial Boards were until 1894 the authorities who enforced the Vaccination Act. The Parish Councils then inherited the function, but it is very obvious that it ought to be transferred to the authorities under the Public Health Act. In 1876 arrangements were made with the City Parish to have lists of defaulters passed on to the Medical Officer after the Parochial officials had dealt with them. It was found that the epidemic inspectors were able to discover 26 per cent. and procure the vaccination of 6 per cent. of these defaulters, the remaining 20 per cent. being actually vaccinated, although not certified. In 1881 all the City Registrars were asked to return from week to week the names and addresses of all children who were still unvaccinated a fortnight after the issue of the notice served by the Registrar on the guardians in accordance with the 17th Section of the Act. These were distributed among the Sanitary Staff, with the result that whereas previous to 1876 the proportion of children born in Glasgow who were not accounted for either by vaccination, death, or postponement, varied between 3 and 4 per cent., in the first year of limited inquiry by the Sanitary Department it fell to 2.8 per cent., and in the first year of complete inquiry to 2 per cent.

Having secured as far as possible a primarily vaccinated population, the next line of defence against Small-pox is still vaccination,—vaccination reapplied as a system to every person of 10 years or upwards, and as a special process to all persons within the infected area which surrounds every case of Small-pox. Systematic revaccination can only in this country be promoted by promulgating the opinion of the local authority that the practice is commendable, by announcing that practitioners are authorised to perform the operation gratuitously (*i.e.* at the cost of the local authority) in cases where persons cannot afford a fee, and by giving this advice and these facilities special publicity when Small-pox is present. All this is done in Glasgow. Special means are also adopted to get at sections of the community who are likely to encounter and import Small-pox. Of these the criminal population, so largely interfused with the tramp element, causes most solicitude. An arrangement is made under the sanction of the Prison Board, with Prison Surgeons to offer revaccination on behalf of the local authority to every person committed for more than ten days; and to vaccinate every unvaccinated prisoner. Through Reformatories, Church-missions, employers, &c., &c., and through the propaganda of the staff, a constant pressure is maintained towards the same end.

The best method of carrying out re-vaccination as a special preventive process in the face of existing Small-pox was only worked out after careful consideration of the results of several methods. In 1863 the District Medical Officers went to the infected localities in their districts. After the reconstruction of the Department in 1870, district vaccinating stations were opened for primary vaccination and re-vaccination, each in charge of a medical man. Experience proved (1) that of those who gave their names to the epidemic inspector as willing to be revaccinated a large proportion, before the visit of the District Surgeon or other medical man to whom the list was sent, had thought better of it and refused to be touched, (2) that those who said they would go along to the station never went, (3) that the epidemic inspector frequently found visitors in the infected house who either gave wrong addresses or otherwise managed to escape revaccination, (4) that the number of children brought to the *district* stations was insufficient to keep up a lymph supply. Looked at with an open mind it was clear that the man to carry out revaccination was the epidemic inspector, who was first on the spot, who was known to the people, who probably was there before the removal of the case and gave his advice in presence of the "awful example." Vaccination is a purely mechanical operation, a bit of handicraft. The selection of the lymph is a matter of medical responsibility. If the lymph is selected and put into the hands of a man who has acquired this handicraft, no other conditions are necessary to justify the operation. In December, 1873, this system was adopted. The Medical Superintendent of Vaccination who attends at the vaccinating station attached to the Central Chambers, collected the lymph and taught each inspector the handicraft. Every inspector carries a supply of lymph (now calf-lymph), he revaccinates wherever necessary at the first visit, returning at meal-hours or in the evening to pick up all the stragglers. He is forbidden to vaccinate infants primarily but he sends their names to the medical superintendent or has the child brought to the station. If the parties prefer their own doctor he calls upon him, informs him of the circumstances, supplies him with the lymph if he requires it, calls next day to see if the operation has been done, and does not lose sight of the business until it is ended satisfactorily. All this is done under the close supervision of the Medical Officer to whom everything is reported in detail. Where general revaccination in a close or court, or lodging-house, or anywhere on a large scale is required, the inspectors are sent out at night in pairs or in squads. When Small-pox is increasing and the work growing a young medical man is appointed to take subordinate charge. The success of the system is shown by the fact that whereas in the last three years (1871-3) of the old system the number of persons revaccinated at their residence per case of Small-pox was barely 2, in the last three years (1892-4) under the new the number was 15.

The fear of losing work from sore arms is a natural and serious obstacle to revaccination in the case of working people. If any *bona fide* case of hardship occurs, the arm is dressed and a small daily allowance is paid during disability. The most serious local inflammation arises from drink, rough usage and dirt. Cases in this category are sent to one of our reception-houses where they get free lodgings and food and are kept in bed and sober. In dealing with the Model Lodging-houses belonging to the Improvement Trust a bribe of a week's free lodgings sufficed to induce the inmates to accept re-vaccination after all argument had failed. The same principle was applied to the still larger private "Models," by a pecuniary arrangement with the proprietors. In short it may be said that the local authority of Glasgow has always extended to their medical adviser perfect freedom of action to do anything and everything to promote the prophylactic use of vaccine lymph.

Lastly, a word may be said as to the special demands of Small-pox upon the intelligence, tact, and discretion of the epidemic inspector. To be efficient against Small-pox he must combine the keen scent of the pointer, the wisdom of the serpent, and the common-sense of human-kind. A great part of the difficulty of suppressing Small-pox arises from the extremely modified cases which form the germinating margin of every epidemic. It is in the scenting out and marking down of these for his medical officer that the inspector may show his keenness of observation, while his tact in adapting himself to the character and ways of the people will appear in the success of his offers of revaccination.

ENTERIC FEVER.

Period.	Total Deaths.	No. of Deaths in Hospital.	Death-rate per Million.	Percentage of Deaths in Hospital to total Deaths.
1855-59	...	...	...	...
1860-64	...	...	...	...
1865-69	1140	79	510	7
1870-74	1111	179	453	16
1875-79	1097	264	436	25
1880-84	1032	379	399	37
1885-89	497	210	182	42
1890-94	641	421	205	66

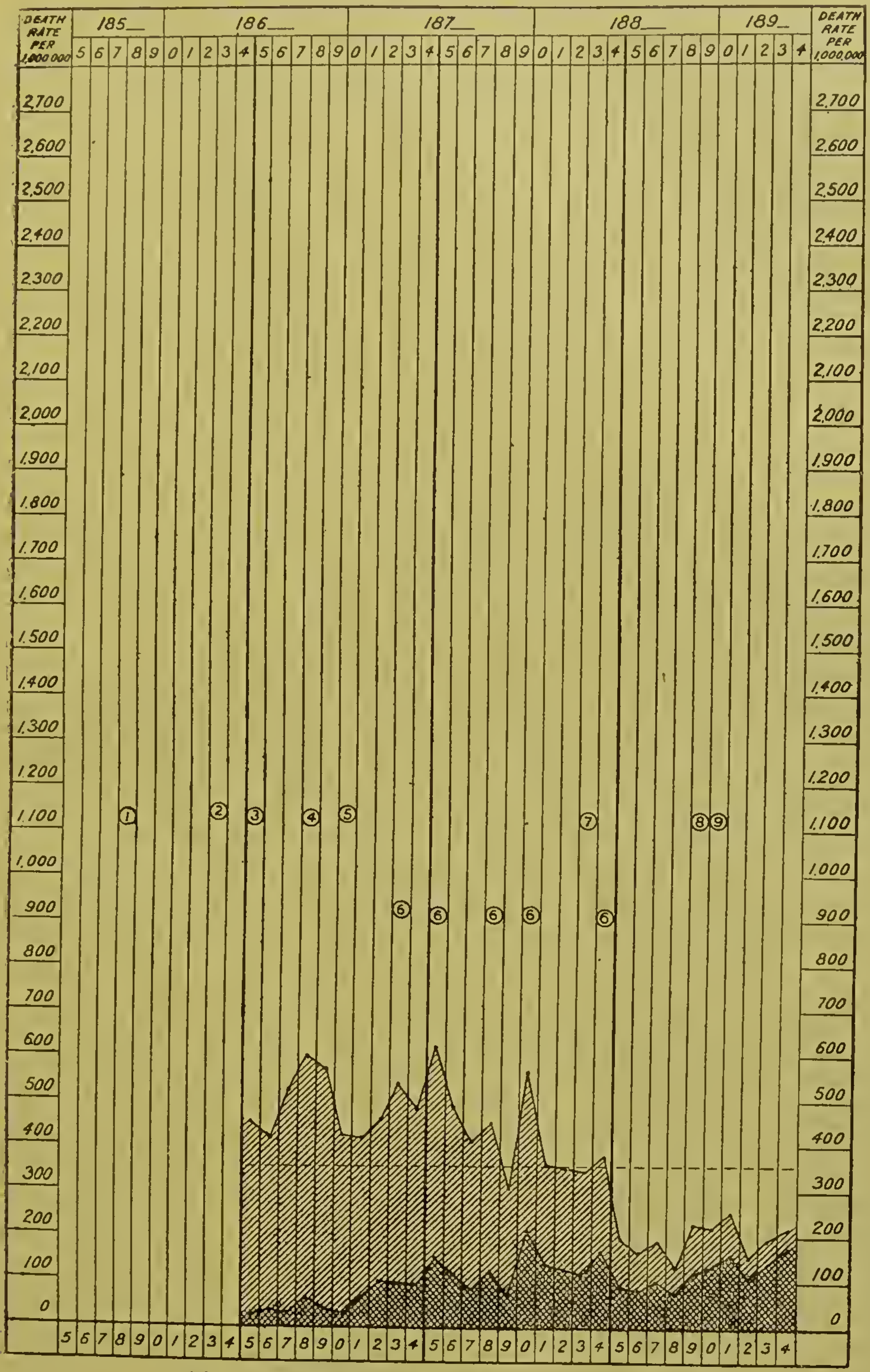
We can refer to no statistics regarding Enteric Fever for the first 10 years of Registration. The Registrar-General did not classify it apart until 1865. To the deaths thus classified we have added those from "Remittent Fever" which are no doubt, especially in young persons, all attributable to Enteric Fever. Indeed since 1877 the Registrar-General has embraced "Infantile Remittent" (previously classified apart) under Enteric Fever.

It is apparent that there has been a great and progressive diminution in the fatality of Enteric Fever in Glasgow since 1865. If we divide the statistics into periods of five years the diminution has been unbroken except by a minute increase in the last over the preceding period. In periods of ten years the decrease in the death-rate per million is thus graded 481, 417, 193. The improvement is practically concentrated in the last decade. What is the cause of it?

No doubt the progressive influence of hospital isolation as shown by the growing proportion of the total deaths which took place in hospital (rising from 7 per cent. in the first 5 years to 66 per cent. in the last, and in 1894 to 77 per cent.) has had an important preventive effect. But if we consider the history of Enteric Fever in detail we observe that every occurrence of anything like an epidemic prevalence has been caused by the distribution of infected milk; and that these epidemics have been recorded in every decade but the last. This matter may best be understood by reference to the diagram in which the annual death-rate is laid down to scale. The milk epidemics are these (1) 1873 Parkhead, (2) 1875 Washington Street, Pollokshaws Road, and Kingston, (3) 1878 West End, (4) 1880 Northern and Central Districts, (5) 1884 Hospitals. If we note the peaks in the curve it will be seen that they fall on the years 1873-75-78-80-84, and these include every year which represents such a peak, viz.—a projection upwards confined to one year. In 1867-8-9 and in 1889-90-91 there are mounds or round-headed elevations spread over three years which were not traced to milk-infection. The history of Enteric Fever in Glasgow therefore leads to those notable conclusions, (1) that her epidemics have all been milk-borne; and since in the first alone was the infection acquired locally (from the milking of the cows in a city byre by a mother nursing children who had Enteric Fever) and in all the others demonstrably from defective water-supply, bad drainage and other defects at the source of supply in the country, (2) that the status of Enteric Fever in Glasgow mainly depends upon rural sanitary administration. It is the case that during the last 10 years of comparative immunity there have been no milk epidemics of enteric fever.

There were three methods of working for the protection of the City upon the indications of these experiences—by legislation, by education, through the commercial relations of buyer and seller. The publication of the facts of these epidemics impressed the public mind very acutely and the local agitation not only initiated local reform in the dairy-trade, but coupled with the action of the authorities had no small share in producing the Dairies and Milkshops Order (1879). Clauses drafted in Glasgow in 1878 for an amended Police Act with

IV. GLASGOW.—DEATH-RATE PER MILLION FROM ENTERIC FEVER FOR 30 YEARS (1865-94), SHOWING THE PROPORTION OF TOTAL DEATHS WHICH TOOK PLACE IN HOSPITAL.



MEAN DEATH-RATE THUS - - - - - - - - -

DIAGRAM NO. IV.—HISTORICAL REFERENCES.

(1) Loch Katrine Water turned on. (2) First Medical Officer of Health appointed. (3) First Municipal Fever Hospital. (4) Cleansing Department organised. (5) Sanitary Department organised. (6) Milk Epidemic. (7) Systematic Drain-testing and special Summer cleansing begun. (8) Privy system condemned. (9) Notification Act adopted.

the intention of facilitating the investigation of these milk epidemics and even authorising inspection of the suspected farms and the exclusion of their product were adopted in the ill-fated Burgh Police Bill and thence in substance in various English local Acts and ultimately in the Infectious Diseases Prevention Act (1890) applicable to England only. This history led to the remarkable result that Glasgow herself only got the benefit of these clauses in 1890 in the Glasgow Police (Amendment) Act. However, much was done by education and the use of the commercial lever. In 1888 a pamphlet was drawn up entitled "The Sanitary Requirements of a Dairy Farm" and distributed by the Local Authority to every farmer within the area of the Glasgow milk-supply and to every milk-agent, to farmers' and dairymen's associations, to rural authorities and others. The plan of campaign was this. The citizens are infected and the business of the milk agent who distributes the infection ruined. The causes are obvious sanitary defects and the actual existence of disease at the farm-steadings from which the milk comes. The local authority points out the main requirements of a dairy farm. They advise all milk agents to visit the farms before making contracts and as one of the conditions of the contract to insist upon the immediate stoppage of the supply and report of the occurrence, when infectious disease appears at the farm. A form of contract on these lines was at once adopted by the Dairymen's Association. The authorities are themselves purchasers of milk in very large quantities for their hospitals. A very stringent special form of contract was adopted requiring every milk agent who made an offer to specify his farms. These were all inspected by special inspectors, reported upon with plans to scale, and a short leet of farms finally inspected by the Medical Officer before the list of those found eligible was reported to the Committee on Contracts. The Directors of the Western Infirmary adopted exactly the same system. In the course of these inquiries and in the investigation from year to year of milk epidemics or circumstances suggesting suspicion of the milk-supply, hundreds of farms were inspected, the reports with relative plans registered, indexed and preserved in the Sanitary Office. Complaints were made to rural authorities and to the Board of Supervision. The hand of the customer in Glasgow was laid upon the factor, the landlord, and the authority; sanitation came to be associated in their minds with self-interest. The money of the town pays the rent in the country, and it was not to be forthcoming except on certain conditions. No doubt the position of the buyer is omnipotent, provided he is intelligent enough to see it and to think it out to its ultimate issues. Milk from a pure source comes in the long run to be a matter of money—a better bargain for the man with a well-ordered steading, a better rent for his landlord, a higher contract-price to the milk-agent, a dearer article to the consumer. The dairymen of Glasgow are a peculiarly well-informed class as to the health aspects of their trade. Everyone of them who conducts his business as advised by the local authority is an effective apostle of sanitation to the rural districts. Of course there are people in all businesses, not excepting those of landlord, farmer and milk agent, who deliberately choose a low standard. The one makes the existence of the other possible. The ultimate sufferer is the poor, thoughtless, helpless customer of the town. It is for the suppression of the former and the protection of the latter that legislation is required.

While we ascribe so large a share in the reduced fatality of Enteric Fever to the prevention of milk epidemics these are after all what may be designated acute events arising from passing causes. The chronic causes of Enteric Fever, those which sustain it as an endemic, are the daily crop of "nuisances" essentially related to excrement-removal which springs up within and about the house, which it is a great part of the business of the nuisance inspector to abolish from day to day; and defects in the cleansing and scavenging of ashpits, courts, and closes for which the Cleansing Department is responsible. The plodding work of the Sanitary Department and the intelligently-developed system of cleansing which has already been commended therefore deserve their share in the allocation of merit. The epidemic peaks rise upon a falling base and this is the work of the hospitals and those departments.

Relapsing Fever.—In March, 1870, the first cases of this disease were recognized in the Municipal Hospital. It had been first detected in this country in the London Fever Hospital in July, 1868, having apparently been introduced by Polish immigrants to Whitechapel. In January, 1870, it appeared in Manchester, in February in Edinburgh, whence it was carried by a tramp to Glasgow. The disease developed slowly until the autumn, when it outran the hospital accommodation. From the middle of October, 1870, until the beginning of January, 1871, an increasing proportion of the known cases was treated at home and the fever spread like wild-fire. The authorities took prompt action. On 11th November they purchased the Belvidere estate. Wooden sheds were run up and filled as soon as finished, the first being occupied on 19th December. By the end of January the epidemic was obviously checked and in February it was on the decline. In the following autumn there was a vigorous rally, but in face of the ample hospital accommodation the disease made no headway, and it disappeared in the summer of 1872. The following is the result of the epidemic so far as concerns deaths :—

	Total Deaths.	Deaths in Hospital.	
		No.	Percentage of Total.
1870, - - - -	121	24	20
1871, - - - -	241	91	38
1872, - - - -	34	7	21

It is very obvious from these figures that Relapsing Fever not only overwhelmed the hospitals but the whole executive. Out of 396 deaths 122, or only 31 per cent., took place in hospital. The new department was not in a position to discover more than a fraction of the existing cases, or to insist upon isolation without careful selection according to urgency. Still, over-crowding was now under control, lodging-houses were regulated, scavenging and cleansing were fairly in hand and disinfection was applied, in all which respects the circumstances were very different from those now to be contrasted.

Relapsing Fever had been epidemic in Glasgow in 1843. It is a disease which produces a low direct mortality—between 2 and 3 per cent., although it very rapidly involves a large area of the population, so that the mass of disease existing at one time is enormous. Probably encouraged by this consideration, the parochial authorities resolved to treat the poor at home. Relapsing Fever almost wholly runs along the lines of poverty so that the great majority of its victims could not get access to the Infirmary excepting at a cost to the parishes of 15s. each. To save this sum the district surgeons were requested to treat cases and allowed to give a few shillings in the way of relief. Otherwise, of course, nothing was done in the way of prevention. The result was that in 8 months 12 per cent. of the population had been attacked. In District 11, between the New Vennel, the Molindinar and Duke Street, the proportion was 27 per cent. If we take the mortality at 3 per cent., then 396 deaths in 1870-72 represents 13,200 cases in Glasgow in 3 years in a population of 492,000, whereas in 1843 there were 32,000 cases in 8 months in a population of 275,000.[1] It is, however, only fair to say that there was great destitution in the city in 1848 but not in 1870-72.

INFECTIOUS DISEASES OF CHILDREN.

The epidemic history of the pre-sanitation age suggests the same sort of questions as Hume's History of England and Disraeli's novels. Was there anybody but Kings and Emperors alive in those days? Is society entirely made up of Dukes and Duchesses? Were there no epidemic diseases in the first half of the 19th century, but Typhus, Small-pox, and Cholera? It is easier to explain why we hear of none but those grand diseases than why historian or novelist should so write. So soon as Registration enables us to ascertain the full facts we find epidemics of Scarlet Fever, Measles, and Whooping-cough mixed up with those of the major infectious diseases, competing closely with them in their contributions to the tale of deaths, and no doubt rivalling them in the bulk of disease existing at one time. In the 20 years 1855 to 1874, the number of deaths from *Scarlet Fever* was 11,377, from Typhus 10,356. In those 20 years the death-rate from Scarlet Fever on four occasions exceeded 2000 per million; on only three occasions in the case of Typhus. The highest death-rate attained by Typhus was 2749 per million in 1865, whereas the maxima of Scarlet Fever were 2906 in 1863 and 3358 in 1874. Compared with Small-pox, Scarlet Fever had in 11 of these 20 years shown a mortality exceeding three figures per million, Small-pox in only one. *Measles* had carried off 7495 persons in the 20 years, and in 1871 reached a death-rate of 1898 per million, which had only three times been exceeded by Typhus. *Whooping-cough* was then what it is now, the most destructive of all our epidemic diseases, not because of its periodic outbreaks but its steady persistency. In the 20 years it caused 12,722 deaths, and in only three of these years failed to raise its annual tribute to four figures per million. As it was in those 20 years, there is every reason to believe it was in the first half of the century. The classification of the burial-records as to the causes of death was founded upon very dubious data, but there is less dubiety about the ascription of deaths to infectious than to other diseases. In 1813, Whooping-cough was of sufficient importance in Glasgow to lead Dr. Robert Watt, a distinguished physician of the day, to write a special "Treatise on the History, Nature, and Treatment of Chin-cough," now best known on account of the appendix :—" An inquiry into the relative mortality of the Principal Diseases of Children and the number who have died under 10 years of age in Glasgow during the last thirty years." He tells us that "next to the Small-pox formerly, and the Measles now, Chin-cough is the most fatal disease to which children are liable," (p. 25) and that the greatest number of deaths attributed to this disease in Glasgow during the 30 years was in 1809 when they amounted to "something more than 11½ per cent. of the whole deaths in the year." In the 40 years of registration the deaths from Whooping-cough have never quite reached the proportion of 9 per cent., and in the last 15 years never 7 per cent. Dr. Alexander Watt reports[1] that in the 5 years 1835-39 the death-rate per million from "Fever" was 3780, Measles 1960, Small-pox 1730, Whooping-cough 1720, Scarlet Fever 830. It is evident therefore that even in the heroic age of epidemics, if the infectious diseases of children excited no popular remark and led to no organized interference it was not because they did not exist, or, though existing, were not deadly. They were *diseases of children.* That was the reason and a sufficient one. Typhus slew the bread-winners, the house-mothers. It prostrated those who represented the vigour of the community and paralyzed its activities. The same instinct which prompted to revolt against Typhus said—let the others alone, our hands are full.

---

[1] The parishes of City, Barony, and Gorbals.

When the dust and smoke of the main battle have cleared away it is possible to discover positions which are held in strength by unbroken detachments of the enemy and to turn the forces to their attack. Every figure given above to prove that the epidemics of those (so-called) minor diseases were frequent and deadly, though overshadowed by the major epidemics, became an argument for attacking them when the latter were broken up. The last epidemic of Typhus occurred in 1869. The epidemic of Relapsing Fever which swept down upon the city like an Asiatic horde in 1870-71 overwhelmed the infant sanitary organization and compelled it to reinforce its hospital strength and extend its washing and disinfecting arrangements. When this vast outburst passed away all the added resources were left free for fresh enterprises. In 1871 the most severe epidemic of Measles on record broke out. The feasibility of dealing with children's diseases had frequently been discussed but always with a sense of hopelessness in view of the inherent difficulties. The district medical staff was instructed to endeavour to get cases of Measles into Hospital by offering to admit mothers with children. In 1873 the medical officer gave instructions to use every means to procure the removal of the first cases in tenements. In that year Scarlet Fever became unusually aggressive, the prelude to an epidemic outburst which culminated in 1874 and was by far the most destructive of any on record. In September the medical officer proposed "to enforce removal to hospital of cases of Scarlet Fever wherever it can with propriety be done, more particularly in those parts of the city where epidemics of all kinds spread rapidly." He was authorized to do so, and a fortnight after he reported that of 122 cases known to exist 34 had been removed "in most cases under warrant." Henceforth the hospital treatment of Scarlet Fever was quietly but firmly pressed, with the result that in place of 28 per cent. of cases of which the officers became aware because of the very fact that they existed in small houses being removed "in most cases under warrant," we now remove above 80 per cent. of all existing cases without having to ask for a warrant once a year.[1] The secret is to have a well-managed hospital with a good reputation for the kindly treatment of the children, to manifest human sympathy with parents in their desire to cling to their children, but to be firm and let it be evident that the firmness is the firmness of reason and not of mere despotism. The same principle of course applies to all forms of infectious disease in children. The preventive utility of hospital isolation in the case of Measles and Whooping-cough is limited by various circumstances. The advantage as regards the individual life is undoubted in the majority of the cases treated in Glasgow—the children of tramps and denizens of lodging-houses. The extension of isolation to the infectious diseases of children included the application of all the other means of prevention, general sanitary supervision and washing and disinfection.

---

[1] Remarks on Mortality Bills of 1839.

The passing of the Scotch Education Act in 1872 had a most important relation to the infectious diseases of children in various ways, not the least of which was by centralizing the control of schools, and so facilitating general regulation. In 1874 negotiations were opened between the Local Authority and the Glasgow School Board with a view to co-operation in an endeavour to prevent the spread of those diseases through schools. It was agreed that no child coming from an infected house or itself infected should be permitted to attend school until a certificate of immunity had been received from the Medical Officer. To secure this, a system of notices of infectious disease where there were children attending school, from the Medical Officer to the Head Teachers and from the Head Teachers and the Board to the Medical Officer was instituted. This scheme of co-operation began in September, 1874, and has worked admirably ever since. When begun it had no legal sanction but this was obtained in 1890. The sending to school or receiving at school of a child from an infected house without a certificate is penalized. At the commencement of each session hand-bills containing extracts from the Act are distributed to the children through the Head-teachers. In 1874 also two popular pamphlets were issued by the Local Authority—"The Management of Scarlet Fever" and "The Law about Infectious Diseases." These have been re-edited from time to time. A copy of the former is left at every house where Scarlet Fever exists and of the latter wherever a case of any infectious disease exists. Altogether it may be said that 1875 is the first year of a new epoch in the history of the infectious diseases of children in Glasgow, for by that time all the preventive armament hitherto used only against Typhus, Small-pox, &c., had been turned upon these diseases, and other procedures specially adapted to their characteristics fairly initiated.

---

[1] In October, 1895, we are removing 89 per cent. of the cases notified.

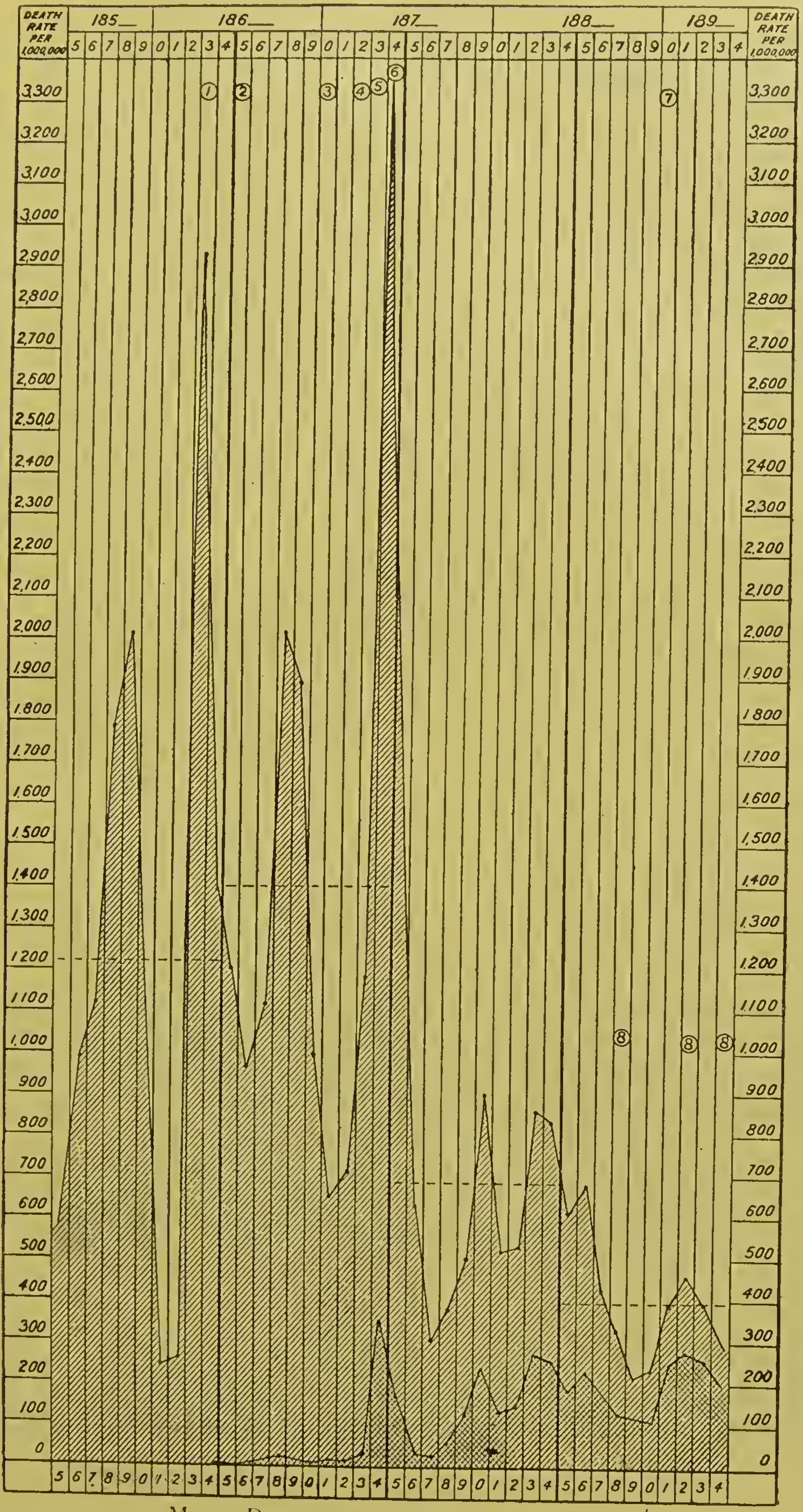
Scarlet Fever.—The following table shows the movements of Scarlet Fever in quinquennial periods. The first three quinquenniads show what Scarlet Fever is when left absolutely to itself. At the end of the fourth period (1870-74), as we have seen, a beginning was made. Compulsory removel was begun in the autumn of 1873, but after all only 4½ per cent. of the deaths that year took place in hospital. In the severe epidemic of 1874 the proportion increased to nearly 10 per cent. In each of the next four periods in which hospital treatment and all the general methods of prevention as well as some special were systematically applied, the proportion of deaths in hospital rose, and the death-rate fell steadily, so that in the last five years it was exactly one-fourth of the rate which prevailed in the five years 1870-74. This result is specially gratifying and encouraging, because it must be confessed that the constant strain upon the whole resources of the Department caused by the growing proportion of patients requiring accommodation

Period.	Total Number of Deaths.	No. of Deaths in Hospital.	Death-rate per Million.	Percentage of Total Deaths in Hospital.
1855-59	2427	...	1301	...
1860-64	2343	...	1141	...
1865-69	3210	25	1429	1
1870-74	3397	209	1379	6
1875-79	1622	214	645	13
1880-84	1862	508	725	27
1885-89	1161	482	435	42
1890-94	1108	729	347	66

Diagram No. V.—Historical References.

(1) First Medical Officer of Health appointed. (2) First Municipal Fever Hospital. (3) Sanitary Department organised. (4) Scotch Education Act. (5) (September) Resolve to enforce Isolation. (6) Co-operation with School Board. Distribution of popular Instructions as to Scarlet Fever begun. (7) Notification Act adopted. (8) Milk Epidemics.

V. GLASGOW.—DEATH-RATE PER MILLION FROM SCARLET FEVER FOR 40 YEARS (1855-94), SHOWING SINCE 1864 THE PROPORTION OF THE TOTAL DEATHS WHICH TOOK PLACE IN HOSPITAL.



MEAN DEATH-RATE THUS - - - - - - - -

and the large demands upon beds made by a disease every case of which occupies a bed for two months or thereby, were producing a sense of despair.

There is nothing special to note about Scarlet Fever excepting its occasional spread by milk-infection, the peculiarity of which is that the infection may in some cases originate in the cow. There have been four milk epidemics of Scarlet Fever detected in Glasgow, two associated with human infection in 1888 and 1893-4, and two with bovine in 1888 and in 1892. The practical lesson is of the same nature in both cases, that no person who suffers from a throat affection of any kind or degree, ulcerative or congestive, with or without eruption, ought to approach dairy cows or intermeddle with milk in any capacity, and that the milk of every cow with a lesion of the teats ought to be isolated and either destroyed or sterilized. These lessons have been carefully impressed upon dairymen and farmers.

MEASLES.

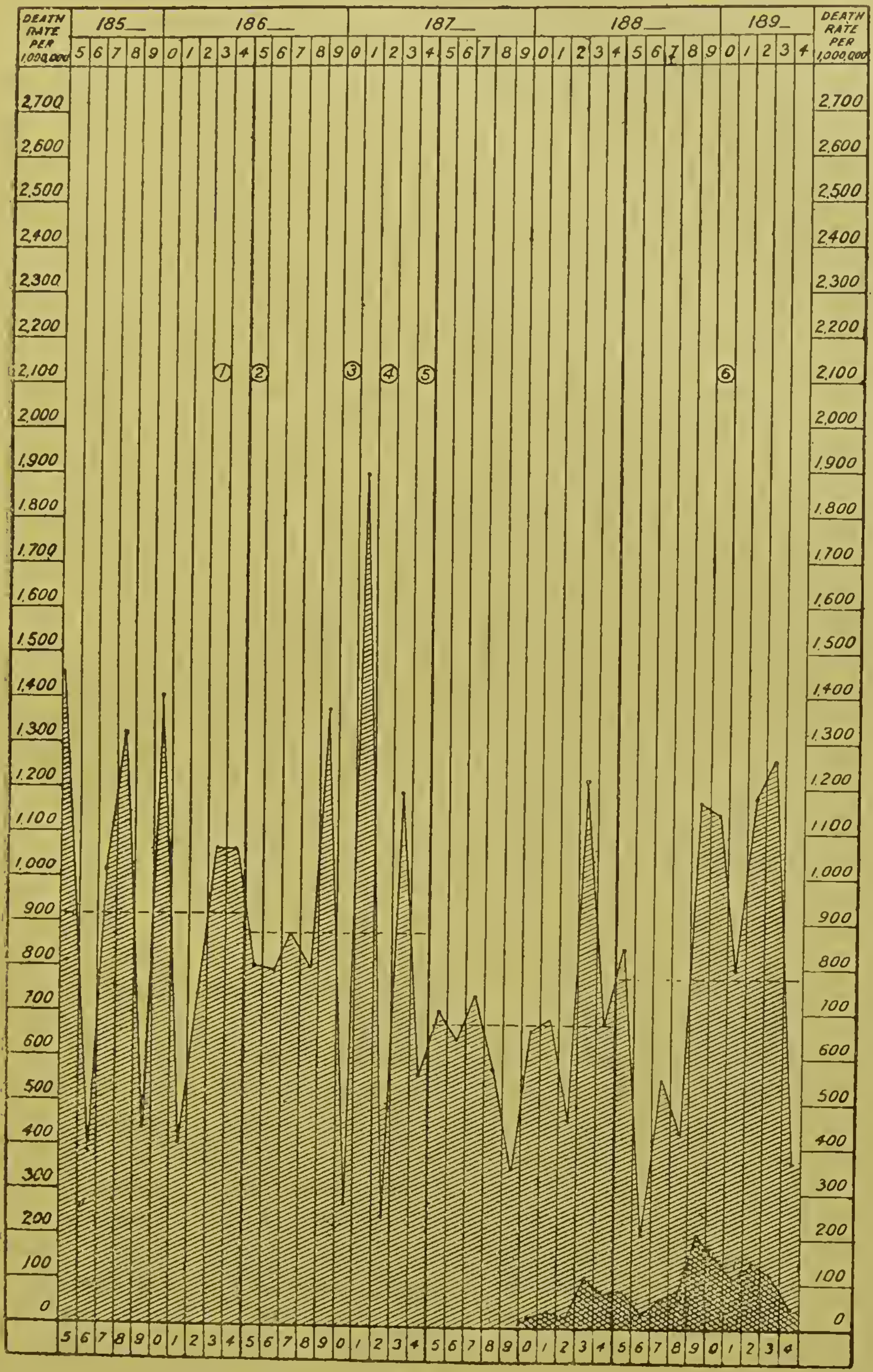
Period.	Total Number of Deaths.	Number of Deaths in Hospital.	Death-rate per Million.	Percentage of Total Deaths in Hospital.
1855-59	1657	...	901	...
1860-64	1817	...	896	...
1865-69	2020	...	901	...
1870-74	2001	...	813	...
1875-79	1449	...	577	...
1880-84	1880	114	725	6
1885-89	1677	222	614	13
1890-94	2965	353	841	12

It is obvious from this table that if any reduction has taken place in the mortality from Measles it is not brought out by the contrast of quinquennial periods. The following extends the periods to four of 10 years and two of 20 years.

	Death-rate per million.	
	10 Years.	20 Years.
1855-64, - - - - -	898	877
1865-74, - - - - - -	857	
1875-84, - - - - - -	651	714
1885-94, - - - - - -	777	

We thus ascertain that the mortality from Measles has declined, but not much and not steadily. It was higher during the last decade than during the preceding, but lower in both than in either of the two decades preceeding that again. We may say that whatever has been gained is to the credit of the

VI. GLASGOW.—Death-rate per Million from MEASLES for 40 years (1855-94), showing since 1880 the proportion of total Deaths which took place in Hospital.



Mean Death-rate thus - - - - - - - -

Diagram No. VI.—Historical References.

(1) First Medical Officer of Health appointed. (2) First Municipal Fever Hospital. (3) Sanitary Department organized. (4) Scotch Education Act. (5) Co-operation with School Board. (6) Police (Amendment) Act—School Attendance Clauses.

last 20 years. The death-rate was 714 per million as against 877 in the previous 20 years. It may be argued that this is nothing more than might well arise from the general improvement in the public health which no doubt would cause the same quantity of existing disease of whatever kind to produce less death; but the decrease in the death-rate from Measles amounts to 19 per cent. whereas the decrease in the same period in the death-rate from miscellaneous general disease was only 8 per cent. It may also be recalled that we have gained nothing in diseases of the lungs. Whatever may be the conditions which favour acute diseases of the lungs they must promote the fatality of Measles. Something therefore may be put to the credit of special repressive measures. Of these, hospital treatment does not count for much. The requirements of Scarlet Fever leave little room for Measles. The largest proportion of the total deaths which occurred in hospital was 17 per cent. in 1889, when Scarlet Fever was at the lowest ebb ever seen. But I believe the preventive results of the isolation of Measles in hospital are in any case small. The acute stage of the infectivity is over before the acute stage of the disease is fully established. Before the case is removed the most of the damage is done. The same remark applies to the ordinary washings and disinfections which are so important in dealing with the major infectious diseases. The stability of the Measles contagium is feeble and its energy through the medium of clothing, etc., small. Speaking generally, the hospital treatment of Measles gives more satisfaction from the humanitarian than the preventive point of view. The cases treated are either the children of the abject poor, those who live in lodgings or sleep on stairs, &c., or they are removed from public institutions. In many ways from the preventive aspect Measles resembles Relapsing Fever and Influenza. They all develop with such rapidity that their mere mass overwhelms ordinary organization and tactics. No infectious disease now-a-days produces such *short-time* death-rates as Measles; yet it cannot compete with either Scarlet Fever or Whooping-cough in *annual* death-rates. The reason is that although it has a low case-rate of mortality, its season is short and it rapidly covers a large area. Hospitals could not contain the cases or any considerable proportion of them although all other infectious diseases were excluded. Even with a temporarily enlarged staff and without compulsory notification, it is impossible to visit and register the cases of Measles known to exist. The washing and disinfecting establishments working day and night can barely keep abreast of their work. Yet Measles is an "infectious disease" and the law draws no distinctions but forbids with the same emphasis the same things in Measles as in Small-pox and is equally imperative as to the duties which may be exacted of local authorities.

The exclusion from school of children likely to be incubating the disease seems the most effectual preventive measure which can be adopted, if not indeed the only one. This can be accomplished only by excluding children belonging to infected families. Though this is done under one general enactment, the nature of the risk is not the same in all diseases. In Measles it is not the risk of a healthy child conveying infection on its clothes, but of a child apparently healthy being really in the most infectious stage of the disease. Therefore, even though a healthy child is removed to another house it cannot safely go to school for a fortnight. In spite of every effort to exclude the incubating child the disease will from time to time be implanted in schools. Then the only useful measure is to close the department of the school in which the disease has appeared. This will almost invariably be the Infant Department. The object still is to separate the incubating from the healthy, and this can best be done by scattering the class and so removing the compulsory intercourse of attendance at the same school. It is not necessary to close the whole school because Measles exists in one section. The method of extension is generally this. One child is seized; in 10 days or a fortnight, two or three more in new families; and so at intervals, each brood rapidly increasing in numbers. This is perfectly certain to happen in the Infant Department. The lesson is to close the department whenever the first brood, the group of two or three, appears.

WHOOPING-COUGH.

Period.	Total Number of Deaths.	No. of Deaths in Hospital.	Death-rate per Million.	Percentage of Total Deaths in Hospital.
1855-59	3163	...	1707	...
1860-64	3214	...	1588	...
1865-69	3262	...	1462	...
1870-74	3083	...	1257	...
1875-79	3362	...	1333	...
1880-84	3437	109	1324	3
1885-89	3144	233	1153	8
1890-94	3079	288	979	10

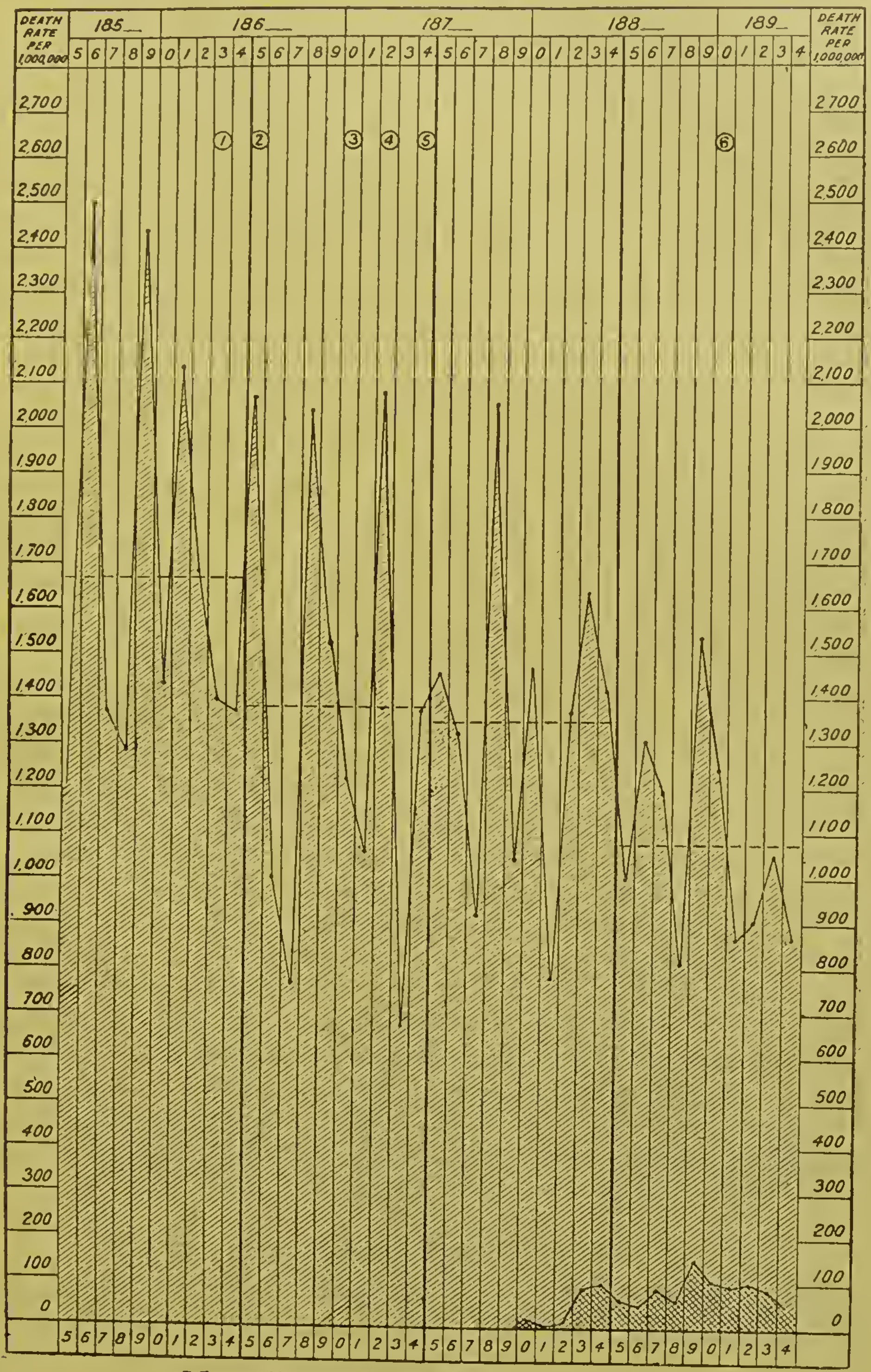
Estimated simply by the number of its victims Whooping-cough is by a long way the most formidable infectious disease known to Glasgow. We might probably generalize and say the most formidable infectious disease of industrial cities. It shoots up into an epidemic at intervals of two to five years. In the height to which its mortality may rise in those years it is considerably excelled by Scarlet Fever alone. In the 40 years of Registration Typhus caused a somewhat higher mortality only once (in 1865), although in the great epidemics of pre-historic times it must have frequently and more decidedly exceeded. But Whooping-cough never subsides to a low level. Its line of mean prevalence is high. Hence even in the palmy days of Typhus in *quinquennial* averages Whooping-cough scores the highest death-rate (Whooping-cough, 1707 in 1855-59; Typhus, 1623 in 1865-69). On the average of 40 years it returns by far the highest death-rate, viz.—1350, no other single disease reaching four figures. Taking the last five years, after sanitation has done its best, Whooping-cough is still left in the position of most fatal disease, with a mortality of 979, but now very closely followed by Measles, 941. The following Table shows most of the figures from which these generalizations are made :—

	Death-rate per Million.		Highest Death-rate per Million in 40 years.	
	40 Years 1855-94.	5 Years 1890-94.		
Whooping-cough	1350	979	Scarlet Fever	3358 (1874)
"Fevers"	985	233	Typhus	2749 (1865)
Scarlet Fever	925	347	*Whooping-cough*	2484 (1856)
Diarrhœa	805	498	Diarrhœa	2215 (1857)
Measles	796	941	Measles	1898 (1871)
Diphtheria & Croup	541	401	Diphtheria & Croup	1188 (1863)

It is so far satisfactory that a disease which is so formidable a factor in the mortality of the city, although still retaining its relative position has not resisted all ameliorative influences. This is clear from the quinquennial Table, which opens with a death-rate of 1707 per million and closes with one of 979; being respectively the highest and lowest of the 8 periods in the 40 years. Between the two extremes there is a decided though not quite unbroken gradation. The following Table exhibits these figures in four periods of 10 years and two of 20 :—

	Death-rate per Million.	
	10 years.	20 years.
1855-64 - - - - -	1647	1503
1865-74 - - - - -	1359	
1875-84 - - - - -	1328	1197
1885-94 - - - - -	1066	

VII. GLASGOW.—Death-rate per Million from WHOOPING-COUGH for 40 years (1855-94), showing since 1880 the proportion of total Deaths which took place in Hospital.



Mean Death-rate thus - - - - - - - -

Diagram No. VII.—Historical References.

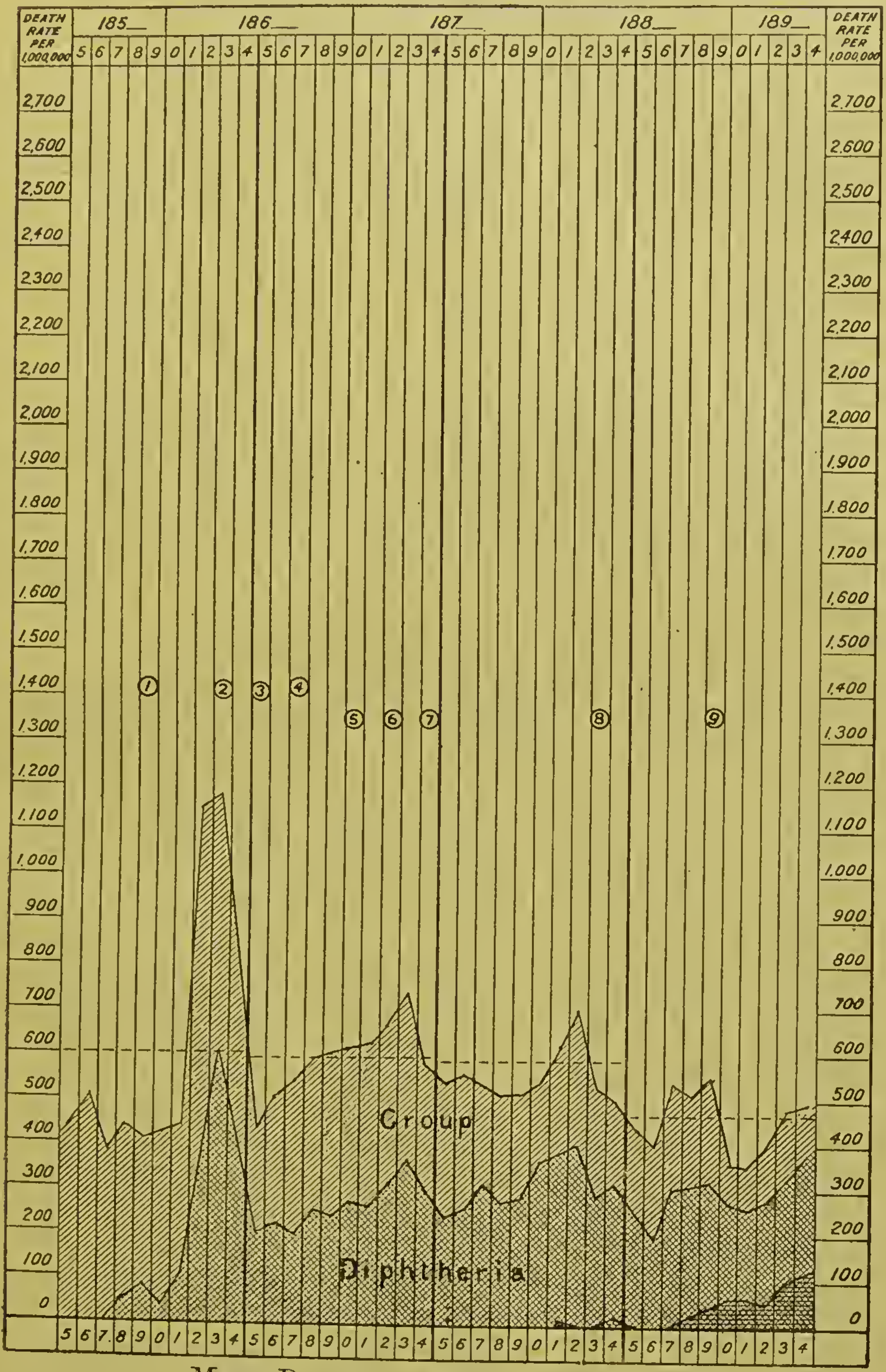
(1) First Medical Officer of Health appointed. (2) First Municipal Fever Hospital. (3) Sanitary Department organized. (4) Scotch Education Act. (5) Co-operation with School Board. (6) Police (Amendment) Act—School Attendance Clauses.

The decrease in the last period of 20 years as compared with the first is 306 per million or 20 per cent. The decrease in Measles it will be remembered was in the same period 19 per cent. As in the case of Measles we cannot credit hospital isolation with much influence. The highest proportion of the total deaths which took place in hospital was 12 per cent. in 1892. The preventive effect of isolating the class of cases admitted to hospital must be considerable in Whooping-cough though doubtful in Measles. They are all peripatetic cases carried or trotted about by the parents. Still the aggregate result of the isolation must be small. The proportion of cases isolated must be much less than of deaths taking place in isolation. The exclusion from school of children from infected families and the application of general preventive measures to Whooping-cough, apart from any direct effect, must have tended to procure from parents, guardians and others a more respectful position for Whooping-cough than that popularly assigned to it. Perhaps the fact of greatest present-day interest in the 330 pages of Dr. Watt's Treatise on Chincough is recorded in the history of the case of his little boy aged 6. About the middle of December he showed " symptoms of a common cold." By Christmas " it appeared pretty obvious that he had got the Chincough. By the New Year this was certain." The " kinks " were fully formed and generally ended in vomiting. Dr. Watt proceeds :—" We were now disposed to take him from school but from a fear of being left behind by his companions, he was exceeding averse to the measure and therefore *continued to attend regularly* till Friday the 8th January." He was then so much worse that he " consented to leave off going to school until he was better," which, poor boy, he was never destined to be. He died on the following Thursday. This is very characteristic of the sort of paralysis of mental assimilation with reference to infectivity which now seems to us unaccountable but which was until comparatively recent times manifest in many ways. Even in Dr. Watt's mind the belief that Whooping-cough is infectious lay inert like a stone in the earth, barren of practical suggestion.

DIPHTHERIA AND CROUP.

The answer to the question, whether Diphtheria is increasing or diminishing in Glasgow, depends somewhat upon how we deal with the deaths returned as attributable to Croup. If we run our eye down the columns of quinquennial death-rates in the above Table we see, speaking generally, that " Diphtheria " " Diphtheria and Croup " are diminishing. The matter is one of so much importance that we give the annual death-rates under those heads during the 40 years of registration.

VIII. GLASGOW.—DEATH-RATE PER MILLION FROM DIPHTHERIA AND CROUP FOR 40 YEARS (1855-94), SHOWING SINCE 1881 THE PROPORTION OF THE TOTAL DEATHS WHICH TOOK PLACE IN HOSPITAL.



MEAN DEATH-RATE THUS - - - - - - - -

DIAGRAM NO. VIII.—HISTORICAL REFERENCES.

(1) Loch Katrine Water turned on. (2) First Medical Officer of Health appointed. (3) First Municipal Fever Hospital opened. (4) Cleansing Department organized. (5) Sanitary Department organized. (6) Scotch Education Act. (7) Co-operation with School Board. (8) Systematic Drain-testing and special Summer cleansing begun. (9) Notification Act adopted. Police (Amendment) Act—School Attendance Clauses.

DIPHTHERIA AND CROUP.

Period.	Deaths.			Diphtheria Deaths in Hospital.	Death-rate per Million.			% of Diphtheria Deaths in Hospital.
	Diphtheria.	Croup.	Diphtheria and Croup.		Diphtheria.	Croup.	Diphtheria and Croup.	
1855-59	45	712	757	...	24	386	410	...
1860-64	558	1012	1570	...	271	498	769	...
1865-69	431	723	1154	...	192	323	515	...
1870-74	674	883	1557	...	275	360	635	...
1875-79	641	747	1388	...	254	296	550	...
1880-84	811	664	1475	21	313	256	569	3
1885-89	707	595	1302	48	259	218	477	7
1890-94	882	397	1279	244	276	125	401	28

DEATH-RATES PER MILLION.

Year.	Diphtheria.	Croup.	Diphtheria and Croup.	Year.	Diphtheria.	Croup.	Diphtheria and Croup.
1855	...	407	407	1875	218	321	539
1856	...	491	491	1876	243	306	549
1857	8	344	352	1877	303	353	656
1858	48	372	420	1878	247	254	501
1859	63	318	381	1879	260	248	508
1860	31	372	403	1880	316	218	534
1861	86	342	428	1881	344	269	613
1862	342	806	1148	1882	374	317	691
1863	589	599	1188	1883	248	270	518
1864	306	371	677	1884	284	208	492
1865	161	257	418	1885	214	206	420
1866	190	290	480	1886	176	215	391
1867	168	357	525	1887	283	253	536
1868	233	327	560	1888	305	195	500
1869	211	383	594	1889	317	223	540
1870	248	359	607	1890	244	119	363
1871	236	382	618	1891	229	115	344
1872	285	372	657	1892	242	130	372
1873	334	400	734	1893	307	152	459
1874	271	289	560	1894	357	109	466

We have here the whole history of Diphtheria. It was not recognized and was not classified apart until 1857. "Croup" always had a place in the nosology of death. We find it in the Mortality Bills regularly, but "Diphtheria" was then and until 1857 unknown. If we look at the parallel course of the diseases as shown by their respective death-rates we must be struck with remarkable signs of relationship. In 1862-3-4 Diphtheria burst out into an epidemic, and Croup shows a synchronous epidemic development. The figures for these epidemic years with the years preceding and following them are—

Diphtheria, -	86	342	589	306	161
Croup, - -	342	806	599	371	257

There can be but one inference drawn from this parallel movement, viz.—that the same cause produced two forms of disease so different in their symptoms, as to lead men to call them by two distinct names, while they were in reality one disease. If we follow the subsequent course of the two diseases we observe the general tendency of the death-rate from Diphtheria is to rise and synchronously of that from Croup to fall. The mean death-rate in 40 years of the former is 233, of the latter 308. We find that in the first 20 years the death-rate from Diphtheria was *below* the mean in 11 years, and from Croup *above* the mean in 17 years; while in the last 20 years the death-rate from Diphtheria was *above* the mean in 16 years, and from Croup *below* the mean in 17 years. There is here a clear suggestion of transference by improved diagnosis and deeper vision into the character of the disease hitherto called Croup. The diagram showing the combined movements of the two diseases year by year conveys this interpretation of the apparent increase of Diphtheria more unmistakably and convincingly than any purely statistical exposition of the case. The further question arises—Is not "Croup," which in the first epidemic outburst of Diphtheria when the criteria by which that disease is distinguished were imperfectly known became so very much more fatal and which as those criteria become known is gradually being displaced by Diphtheria, in the main really Diphtheria? Of course, this involves the further question—Was Diphtheria after all a new disease? With this, however, we have nothing now to do. What we do maintain on the evidence of these facts is that we get a much more accurate gauge of the fatality of Diphtheria from year to year by including Croup than by omitting it. There may be a small residuum in Croup which is *not* Diphtheritic. Time will show. The influence of the Infectious Disease (Notification) Act has been remarkable. It requires notification of Diphtheria and Membranous Croup. The effect upon Croup was immediate. In each one of the five years during which the Act has been in force the death-rate from Croup has been less than in any one of the preceding 35 years, and in the last year it is the lowest on record.

That threatened permanent, endemic rise of Diphtheria which is being observed in London and elsewhere with so much anxiety is not yet apparent in Glasgow. This may be most quickly appreciated by looking at the diagram which shows nothing but the characteristic ebbs and flows of an epidemic disease. During the last four years it has slowly increased, but still the average of the last five years is lower than that of each of the three preceding periods of five years. As this covers the whole of the period of compulsory education it is clear either that in Glasgow the influence attributed elsewhere to schools has not been exercised or has been neutralized by some counteracting agency. The system of co-operation with the School Boards which has already been described may have had some influence. It has practically covered the whole period of compulsory education. The special pains expended in securing the soundness of the house-drains and soil-pipes of Glasgow and the improved system of scavenging and cleansing the precincts of the house as well as the general sanitary work have all helped. The hospital isolation of Diphtheria has a high preventive value, and the serum treatment now gives it also a direct return in life-saving. Notification led at once to a great increase in hospital treatment as indicated by the proportion of deaths. In the five years preceding notification 7 per cent. of the deaths from Diphtheria registered as such took place in hospital; in the five years of notification 28 per cent.; in the last year (1894) 36 per cent. As a fact 19 per cent. of the *cases* notified as Diphtheria and Membranous Croup were removed to Hospital. It is worth adding that we have hitherto not had in our hospitals that post-scarlatinal Diphtheria which is so serious a feature of the hospital treatment of Scarlet Fever in London.

DIARRHŒAL DISEASES *(Diarrhœa, Dysentery, Cholera)*.—These have an interest not only in themselves as contributing no inconsiderable share to the general mortality but because of their relationship to Cholera and Enteric Fever in a common cause—organic, mainly excremental impurity. The degree of chronic prevalence of Diarrhœa gives a fair measurement of the probability of Cholera becoming epidemic in a locality and indicates the soil whence a chronic crop of Enteric Fever is likely to spring. Given an impure water supply, then you have a steady and severe drain on the population from Diarrhœa, violent explosions of Cholera as often as the specific contagium is cast into their midst and a chronic prevalence, with periodic epidemics, of Enteric Fever. Given a pure water supply, then you have a drain moderated in proportion to the character and efficiency of the local system of excrement collection and disposal, to the scavenging and the infinite variety in family cleanliness in this regard which in cities especially tells heavily for or against the young. Cholera will obtain but a passing foothold, should it happen to alight, and Enteric Fever, unless distributed in the milk supply, will only occur in scattered cases.

No better illustration of these facts could be cited than is afforded by the history of Glasgow. There have been three stages in the quality of the water supply. The wholly polluted stage, when Clyde water was supplied, up to 1848; the partially polluted stage, from 1848 (February) when the Gorbals gravitation water was introduced on the south of the Clyde; the wholly pure stage from 1859, when Loch Katrine water was distributed to the north of the Clyde. In the *wholly polluted stage* "Bowel Complaints" bulk very largely in the rude nosology of the Mortality Bills. On the average of the 7 years 1838-44, they caused an annual death-rate of 3360 per million and constituted 12 per cent. of the total deaths. The *partially polluted stage* reaches within the period of registration, when the highest death-rate recorded from diarrhœal diseases was 2215 per million or 7 per cent. of the total deaths in 1857. In the *wholly pure stage* the highest recorded death-rate was 1114 in 1868 or scarcely 4 per cent. of the total deaths. The history of Cholera is exactly such as those facts would lead us to anticipate. It is shown in the following Table prepared by the Rivers Pollution Commission.[1]

MORTALITY FROM CHOLERA IN GLASGOW.

	Polluted Water Period.			Pure Water Period.
	Wholly.	Partially.		
Year of Cholera Epidemic,	1832	1849	1854	1866
Total Mortality in Glasgow,	2842	3772	3886	68
Mortality per 10,000 of population	140	106	119	1·6

In 1866 there were 19 cases treated in Hospital of which 13 died. The first was a seaman from a Highland smack in the harbour. This case had no known antecedent or consequent. The first native cases arose in the New Vennel and there alone was an epidemic tendency shown. The circumstances so well illustrate the only sources of risk in Glasgow now that the water-supply is pure that a note of a visit made to the spot with Dr. Gairdner may be quoted,—“ At 51 New Vennel, from which the first two cases came, we found the body of a son lying on a heap of loose straw from which the old father had just been removed to die in the hospital. Saving the body and the straw, and a little precocious girl keeping an unconcerned watch over her dead brother, there was nothing else in that miserable hovel—far inferior to the burrow of a Bosjesman. The front land was soaking in unmentionable filth from basement to attics; and a kindly remonstrance from Dr. Gairdner to a female whom we chanced to encounter, elicited only angry abuse from her and a friendly advice from a workman hard by, to hold our tongue and take ourselves off as quickly as possible.[1] Isolated cases arose in similar spots in all parts of the city. It was not any change in the general sanitation of Glasgow in 1866 which saved it from the fate of 1854. There was no essential difference between the places to which the Cholera led us in 1866 and those to which it led Dr. Sutherland in 1849; excepting that pure water abounded in the Wynds and Vennels. The New Vennel no longer exists. It is doubtful if the abode of one of the Cholera cases of 1866 could now be identified. The condition of the city has been revolutionized both structurally and as to the daily service of cleansing. Watch and ward for the advent of cholera from the continent has been maintained every summer and autumn since 1883, when under the name of “ Special Cholera Precautions ” extra measures were adopted to render the courts and closes and precincts of the tenement houses *clean* during the diarrhœa season. These have been renewed annually. They consist very largely in the free use of water in washing out the courts, &c., with hose. It is a mistake to limit our estimate of the health value of a generous supply of water to its use as a beverage. The unstinted supply of water for such purposes of public cleansing is of great importance and could not have been enjoyed had it been purveyed by a private enterprise.

---

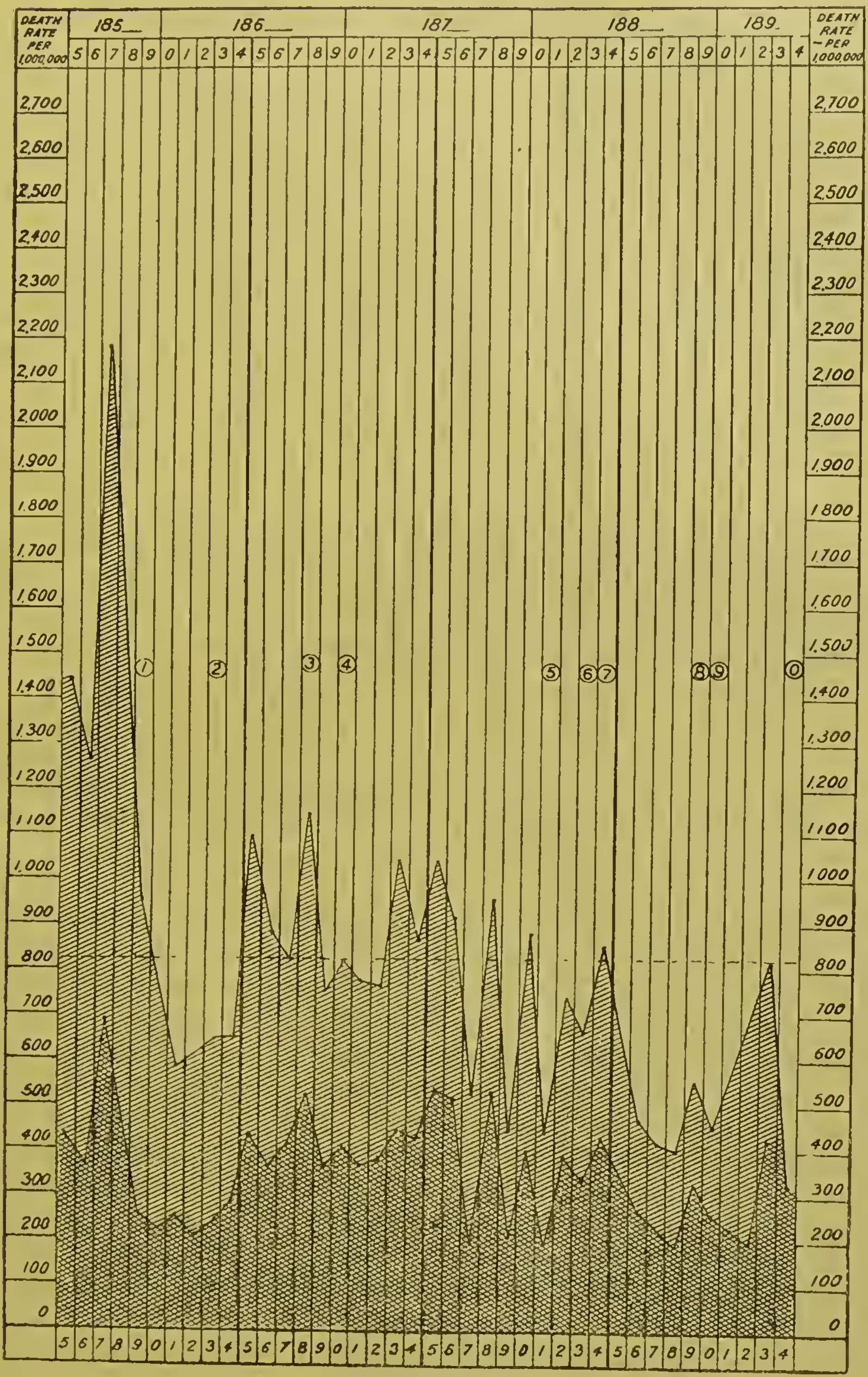
[1] 6th Report—Water Supply, p. 153. The words "wholly" and "partially" are not in the original Table, but attention is pointedly directed to the gradation in the text of the Report.

The only cases of Cholera seen since 1866 have been in the persons of two emigrants on their way to America in August, 1892. The current record of the result of progressive efforts to secure cleanliness in Glasgow as to excremental nuisances has been partially exhibited with reference to Enteric Fever. The diagram shows the history of diarrhœal diseases, a synopsis of

---

[1] Report on the City of Glasgow Fever Hospital for the year 1866-67.

IX. GLASGOW.—DEATH-RATE PER MILLION FROM DIARRHŒAL DISEASES FOR 40 YEARS (1855-94), SHOWING PERCENTAGE UNDER 1 YEAR.



MEAN DEATH-RATE THUS - - - - - - - -

DIAGRAM NO. IX.—HISTORICAL REFERENCES.

(1) Loch Katrine Water turned on. (2) First Medical Officer of Health appointed. (3) Cleansing taken over by Municipality. (4) Sanitary Department organized. (5) First Refuse Despatch Work. (6) Annual Cholera Precautions begun. (7) Second Refuse Despatch Work. (8) Resolution condemning Privy System. (9) Third Refuse Despatch Work. (10) First Sewage Purification work opened.

which is contained in the following Quinquennial Table :—

Period.	Deaths.			Death-rate per Million living.			Percentage of Deaths under 5 Years.
	Under 5 Years.	5 Years & Upwards.	All Ages.	Under 5 Years.	5 Years & Upwards.	All Ages.	
1855-59	1614	1105	2719	6255	695	1475	60
1860-64	876	454	1330	3092	260	656	66
1865-69	1435	618	2053	4684	321	922	70
1870-74	1561	531	2092	4638	251	853	75
1875-79	1510	458	1968	4374	210	781	77
1880-84	1389	496	1885	3915	221	727	74
1885-89	1101	339	1440	3155	143	529	76
1890-94	1244	350	1594	3090	127	502	78

The first thing that strikes one is that the Diarrhœal death-rate was higher in the first 4 years of the forty than it has ever been since. The death-rates per million of the 5 individual years of the first quinquennium are—

1855 - 1445
1856 - 1263
1857 - 2215
1858 - 1507
1859 - 493

It was in October, 1859, that Loch Katrine was substituted for Clyde water. Although it is obvious from the subsequent course of the death-rate from year to year as well as from the quinquennial averages that there are other factors in the causation of diarrhœa, and that we cannot ascribe to this event all the coincident improvement, yet it permanently lowered the mean line of diarrhœal fatality. The mean death-rate of the 35 years of pure water is 710 as compared with 1475 in the five years of impure. All the subsequent peaks in the curve rise from a lower basis. The factor in the production of diarrhœa which is constant and beyond influence is high temperature (probably the temperature of the earth) but pure water, pure air, pure earth, cripple its noxious influence. Between the death-rate of the first five years and the last there is a decrease of 66 per cent. A remarkable feature of this decrease is the inequality of its age distribution. This appears from the proportion of the deaths under 5 years, which increases from 60 per cent. in the first or impure water period to 78 per cent. in the most recent 5 years. Two conclusions are apparent on the face of the successive figures. The immediate effect of the change to pure water was to lower the general death-rate to less than half, but to raise the proportion of deaths of children under 5 years from 60 per cent. to 66. Therefore diarrhœa in children does not depend so intimately upon the water-supply as diarrhœa in adults. Further, the other measures which have promoted the reduction of the diarrhœa death-rate have failed to benefit children even more conspicuously than the introduction of pure water. This is proved by the fact that the proportion of child-deaths increased in spite of all those measures from 66 to 78 per cent. The actual state of the matter is that the death-rate under 5 years is now (1890-94) exactly what it was 30 years ago (1860-64) while the death-rate at 5 years and upwards is less by more than half. In the following Table this disconcerting fact seems to be brought nearer to an explanation :—

Period.	Deaths.		Death-rate under 1 Year per 10,000 born.	Birth-rate per 1000.	In every 10 Deaths from Diarrhœa.		
	Under 1 Year.	1-4 Years.			Under 1 Year.	1-4 Years.	5 Years & Upwards.
1855-59	833	781	110	41	31	29	40
1860-64	500	376	60	41	38	28	34
1865-69	937	498	102	41	46	24	30
1870-74	1017	544	104	40	49	26	25
1875-79	1038	472	101	41	53	24	23
1880-84	915	474	93	38	49	25	26
1885-89	754	347	77	36	52	24	24
1890-93	738	326	87	35	55	24	21

The effect of the introduction of pure water was to diminish the number of diarrhœal deaths under 1 year 40 per cent.; from 1 to 4 years, 52 per cent.; and from 5 years upwards, 59 per cent. The unequal incidence of the advantages of pure water raised the proportion of infantile deaths from 31 per cent. to 38 per cent. and lowered the proportion of deaths of older children from 29 to 28 per cent., and of all aged 5 and upwards from 40 to 34 per cent. This inequality has not been redressed by general sanitary measures, but in spite of them from year to year an increasing proportion of the fatal diarrhœa has been contributed by the infant population until we have now this very startling contrast between the age composition of 100 deaths at the beginning and at the end of the 40 years.—

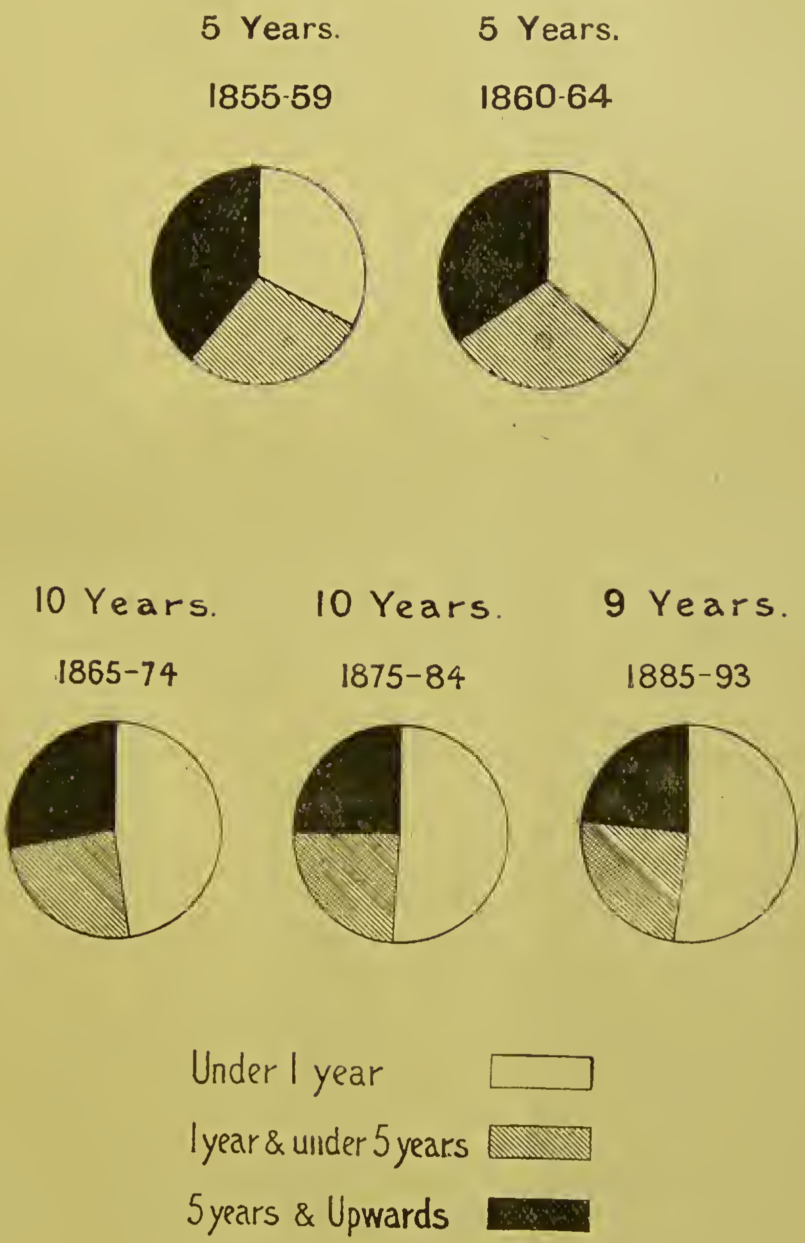
Under 1 Year.	1—4	5 & upwards.
31	29	40
55	24	21

This result is made still more remarkable when we note that the birth-rate has in the interval fallen from 41 to 35, so that the increased proportion of deaths has been derived from a diminished number at risk. The absolute state of the case is shown by the diarrhœal death-rate under 1 year calculated per 10,000 births; and it is this. In the 34 years of pure water the infantile death-rate has always been below the mean of the five years of impure water, but from 1865 to 1879 there was a period of high mortality which almost wiped out the improvement. In the last 14 years, with a falling birth-rate, there has been a slow diminution in the diarrhœal death-rate, but it is still considerably above the point to which it dropped in 1860-64. This is brought out by throwing the last 30 years into longer periods, thus—

5 years	1855-59	110
do.	1860-64	60
10 years	1865-74	103
do.	1875-84	97
9 do.	1885-93	82

What were the measures which may be held to have told mainly against the causes of diarrhœa? They were the taking into its own hands by the municipality of the cleansing of the city (1868); the organization of nuisance inspection and removal (1870); the gradual revolution in the efficiency of filth removal, the stages of which are marked by the erection of the Refuse Despatch Works in 1881, 1884, and 1891; the adoption of special summer and autumn cleansing in the tenement districts (1883); and the commencement of the abolition of the privy system (1889). It would seem that such cleanliness as is within public control does not so intimately reach the environment of the child as of the adult. In short, it is domestic cleanliness, which is under parental and especially maternal control which largely determines the purity of the surroundings—the bed-clothes, the house-air, the person—of the child and of the food. No doubt the cleansing of the court benefits the older children because it is their playground, and the substitution of water-closets for privies discourages the retention of filth in the confined house-space and so advantages all children, but the mother is after all the domestic sanitary inspector. The authorities can only give her every facility to be clean. The Female Inspectors added to the staff in 1870 were specially intended to instruct and stimulate mothers in these respects. They encourage them to go to the public washing-houses with their clothing and bedding, and give to the poorer house-wives orders for material and the loan of brushes wherewith to white-wash, &c., their houses. In 1874 a simple tract on the Management of Children was drawn up by the Medical Officer and arrangements made by permission of the Registrar-General, that every person registering a birth should receive a copy from the registrar.

X. GLASGOW.—AGE-DISTRIBUTION OF 100 DIARRHŒAL DEATHS.



Erysipelas.—In Glasgow we have always been in the habit of occasionally treating cases of Erysipelas in Hospital for humanitarian reasons. The disease is one with which it is within the powers of the Local Authority to deal, and when a destitute person came to the Office the quickest and most satisfactory course to adopt was to send the case to Belvidere. The Infectious Disease (Notification) Act changed all that. The mention of Erysipelas in the same category as Small-pox, Typhus, &c., and the compulsory notification to the Medical Officer of all alike brought with it the implication of similar responsibilities resting upon the authorities. Medical men began to recommend removal to hospital, and above all the Inspectors of Poor referred paupers suffering from Erysipelas to the Sanitary Department. The result has been that of the 1446 persons treated in the municipal hospitals in 24 years, 926 have been treated in the 5 years of the Notification Act, and only 520 in the prior 19 years, or 185 per annum in place of 27. Erysipelas follows Scarlet Fever, though with a long interval, in the number notified, which was 5756, of which 16 per cent. were removed to hospital. This is a very troublesome result of placing Erysipelas as an infectious disease in the same category as those in the prevention of which the hospital occupies a foremost and essential place. Our experience of Erysipelas as notified is that it is either some slight condition of tumefaction and redness, frequently in the vicinity of the nose, which sits so lightly on the individual that when the inspector calls he is out, or it is a complication of some serious surgical condition, a blush on the surface of an abcess or over a periostitis, or the disease involves the deep cellular tissue and ends in a serious surgical condition. The former class of cases is the subject of jocular remark among the staff who notice that they are most frequent in the notifications of Monday mornings. The latter leads to remonstrance from the hospital where the men find themselves burdened with the care of surgical cases which require free expenditure of time in dressing and which occupy beds for months on end. Ample as the resources of Glasgow are Erysipelas is as regards hospital treatment a great nuisance. We find it impossible in times of epidemic Scarlet Fever to deal with it, and require to get assistance from the general hospitals and to appeal to the parishes to accommodate their paupers. At all times we are without the satisfaction of belief in the preventive necessity or utility of the work. The following is the record of the mortality from Erysipelas in 4 decennial periods :—

	Deaths.	Death-rate per Million.
1855-64	449	115
1865-74	517	110
1875-84	539	105
1885-94	531	90

There has been a steady diminution in the death-rate from Erysipelas amounting to 22 per cent. in the last decennium as compared with the first. Antiseptic surgery, and the refined conception of cleanliness which has extended therefrom into all forms of surgical procedure and into hospital management, probably have had more to do with the prevention of fatal Erysipelas than anything else.

Puerperal Fever.—Much that has been said as to Erysipelas applies equally to Puerperal Fever. We have always from humanitarian motives admitted casual cases to hospital. Since the adoption of the Notification Act 361 cases have been certified and 51 of these have been removed. The enormous mortality both in hospital and in private (47 per cent. and 65 per cent.) proves that nothing can be said on the score of triviality by way of objection to the notification of such a disease. But what is "Puerperal Fever"? We find the following in the Nomenclature of Diseases drawn up by a Joint Committee appointed by The Royal College of Physicians of London :—

"Septicæmia. Puerperal Fever.—The term 'Puerperal Fever' should no longer be used. Pyæmia, Septicæmia, and Erysipelas occurring in puerperal women should be described as 'Puerperal Pyæmia,' 'Puerperal Septicæmia,' and 'Puerperal Erysipelas,' respectively. The other conditions included under the term 'Puerperal Fever' should be returned according to No. 513, p. 117, under Diseases of Parturition, the word 'Puerperal' being in all cases prefixed to the word denoting the local process."

It is very unfortunate that in the face of such an expression of opinion, which is founded on a sound pathology, anything should have been made notifiable under the name of "Puerperal Fever." The fact will doubtless establish and give currency to the name. The requirement raises many conscientious questionings in the minds of practitioners. The results of certifying are serious. An officer calls to enter the case and deal with it as an "infectious disease." This may not have any untoward result where the patient is lying in the far recesses of a large house and only hears what she is told, but in tenements, where the main door opens into the one-room house, or if there is more than one room, still every word spoken to a caller is audible in the lying-in room and probably a mother opens the door, the whisper of "Puerperal Fever" may have a very grave effect. After all, what is the good of notifying "Puerperal Fever," whatever it is, to the authorities? There is not a single preventive step which can be taken in consequence unless in the case of midwives, and experience shows that this is the rarest of occasions for usefulness afforded. Medical men ought to be left to be their own medical officers of health in relation to all puerperal conditions. The following are the statistics of "Puerperal Fever" under the various designations of "Metria," "Puerperal Fever (Metria)," and "Puerperal Fever" under which it has been registered in Scotland for 40 years. The maternal death-rate is calculated on the births. There is an astonishing uniformity of mortality during each of the four decennia. It is especially noteworthy that in the last 10 years, notwithstanding antiseptic midwifery, the mortality has been higher than in any previous period.

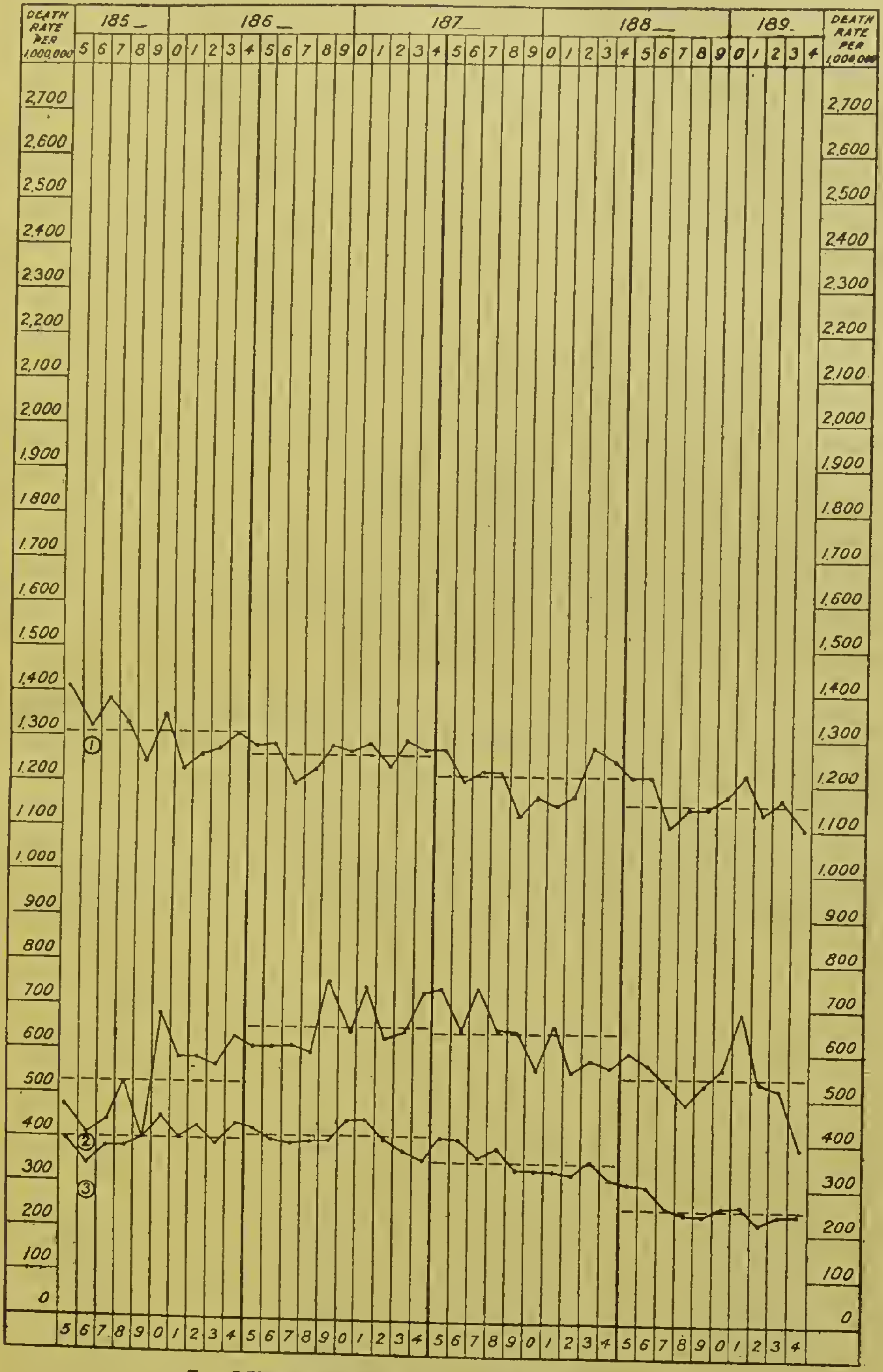
	Births.	Maternal Deaths.	Rate per 10,000 Births.
1855-64	159,231	302	19
1865-74	189,599	359	19
1875-84	201,524	389	19
1885-94	205,634	463	23

CHICKEN-POX—INFLUENZA.—These diseases may merely be mentioned. *Chicken-pox* is but rarely sent in to hospital as Small-pox, from the freedom with which practitioners ask consultations with the Medical Officer of Health as to diagnosis before committing themselves to removal. The majority is admitted as Chicken-pox, the children of tramps or persons in lodgings, brought to the Sanitary Office by their mothers. Tramps and waifs of all kinds drift to this Office in their extremity. Humanity makes one glad when an excuse can be found in their disease to send them to hospital. *Influenza* is another such excuse, and it figures among the miscellaneous infectious diseases which for the good of the individual rather than of the community have been isolated in the municipal hospitals.

PHTHISIS AND DISEASES OF THE LUNGS.

Typhus bears the same relation to diseases of the lungs as Cholera and Enteric Fever do to diarrhœal diseases. Typhus points to measures which directly tend to remove the *domestic* conditions which favour the prevalence of pulmonary diseases —the prevention of overcrowding, the improvement of ventilation and of natural lighting inside the dwelling and in the stairs and lobbies by which it is approached; the free circulation of the general air and the distribution of sunlight in the precincts of the dwelling by the regulation of building and the proportioning of free space to height; the promotion of cleanliness in the home, in its accesses and environs. The chief *public* measures antagonistic to diseases of the lungs are—the provision of playgrounds convenient to the tenement houses which are the nurseries of the people, of parks arranged for the

XI. GLASGOW.—DEATH-RATES PER MILLION FROM MISCELLANEOUS UNCLASSIFIED DISEASES, PHTHISIS AND DISEASES OF THE LUNGS FOR 40 YEARS (1855-94).



I. Miscellaneous Unclassified Diseases.
II. Acute Diseases of Lungs.
III. Phthisis.

MEAN DEATH-RATE THUS - - - - - - - -

recreation of the youth and the adult, and above all the protection of the general atmosphere from unnecessary contamination. All of these with one very important exception Glasgow may be said to have adopted. We imbibe the purest water and inhale the impurest air purveyed to any city in the Kingdom. The position of the authorities as to the common air-supply is very much the same as if they had continued to distribute Clyde water and compelled every proprietor to provide filters and every tenant to keep the domestic stock of reserve water in special vessels. They have compelled proprietors to adopt every means to admit air in and about the dwelling and tenants to keep the air clean, but they distribute air which is, to begin with, impure. They insist upon wide streets to diminish the breadth of shadow and they allow the sunshine to be cut off from the whole city by a canopy of smoke. With wise forethought they purchase suburban estates covered with stately trees which they desire in the interest of the future to rescue from the axe of the speculative builder. Yet the bushes of the Green and the very contrast between the name and the fact of Kelvingrove predict that the next generation will never sit under the shadow of these trees if nothing is done to check the spreading blight of the city smoke.

PHTHISIS.—It is in harmony with the nature of the diseases that the effect of preventive measures upon the prevalence of Diarrhœal diseases should be prompt, while upon diseases of the lungs, especially upon Phthisis, it should be slow—effect loitering considerably behind cause. The annual movement of Phthisis may be traced in the diagram. The following Table shows the death-rate in quinquennial and decennial periods :—

Period.	No. of Deaths.	Death-rate per Million.	
		5 years.	10 years.
1855-59	6913	3742	3918
1860-64	8298	4094	
1865-69	8859	3972	3940
1870-74	9566	3908	
1875-79	9186	3644	3396
1880-84	8159	3149	
1885-89	7074	2601	2458
1890-94	7287	2315	

The story of these figures is a short one. During the 20 years 1855-74 the mortality from Phthisis was stationary, during the 20 years 1875-94 it has steadily fallen. Between the five years 1870-74 and the five years 1890-94, there was a decrease of 41 per cent. in the death-rate. If we start from the maximum period of fatality (1860-64) the decrease amounts to 44 per cent. The acceptance of the doctrine that every case of Phthisis is the result of a specific infection, that consequently no one is foredoomed to have Phthisis or any other form of tuberculous diseases, gives great precision to our ideas of prevention. The existence and distribution of the tubercle bacillus is the first condition of infection. Since this was discovered in 1882, the knowledge has not only passed gradually into the minds of medical practitioners and so influenced the management of cases of tubercle in man, and dictated certain public measures to medical officers of health, but it has deeply penetrated the general mind. Hence the diffused effects of this doctrine in the direction of controlling the distribution of the infecting element, although impossible to estimate in amount, have been great and growing during the last ten years. In Glasgow there has been since 1889 greater stringency in excluding tuberculous meat from use as food, and since 1890 something has been done by the inspection of dairy-cows to prevent the use of the still more dangerous tuberculous milk. Greater precision and determination have also been given to administrative efforts everywhere to remove conditions known to be favourable to the distribution of the tubercle bacillus both among men and among animals :—ventilation, especially of houses and byres; the removal of dampness by subsoil-drainage and precautions adapted to the foundations and walls of houses; the abolition of dark spaces and enclosures, the dissemination of direct sunlight. The application of the power to close uninhabitable houses contained in the 1890 Act (Section 32) has been chiefly directed against damp and dark houses. But wherever we have to do with a seed we have an almost unlimited means of controlling the propagation of its kind by dealing with the soil, by making it congenial and friendly or incongenial and hostile. It is eminently true of Phthisis that the number of persons infected is but a fraction of those who are exposed to infection; and that the higher the standard of public health and especially the sounder the lungs of the population, the fewer will succumb. Indeed theoretically it is possible to conceive of such perfect health, constitutional and local, as to confer entire immunity. Hence we may without much hesitation ascribe the greater part of the gratifying diminution in the fatality of Phthisis in Glasgow to the gradual improvement in the vital resistance of the population; and a very large share in this improvement must be credited to the limitation of infectious disease. For every youth who dies of Enteric Fever and every child who dies of Scarlet Fever a score are so debilitated as to furnish a friendly host for the bacillus of tubercle. Measles and Whooping-cough not only shatter the general health but irritate the lungs and induce the bacillus to settle there by whatever channel it has gained access to the system. One of the most powerful predisposing causes of Phthisis and one which we have not yet done much to diminish is the universal catarrh of the lungs which is provoked by our damp smoke-laden atmosphere. Lungs in such a condition are like the field ploughed and pulverized for the seed scattered by the hand of the husbandman.

Other Diseases of the Lungs. This includes everything classified by the Registrar-General under "Diseases of the Respiratory System" except Croup. The diagram shows their movement from year to year and this Table the death-rate in quinquennial and decennial periods.

Period.	No. of Deaths.	Death-rate per Million.	
		5 years.	10 years.
1855-59	8,042	4,355	5,170
1860-64	12,127	5,984	
1865-69	14,137	6,323	6,522
1870-74	16,483	6,721	
1875-79	17,085	6,777	6,322
1880-84	15,196	5,866	
1885-89	14,585	5,360	5,329
1890-94	16,543	5,298	

The fatality of Diseases of the Lungs increased steadily during the 25 years 1855-79 and fell very slowly in the last 15 years, 1880-94, but still remains considerably above the rate of 35 years ago. If we take periods of 5 years, the death-rate is 18 per cent. higher in the last than in the first. If we take 10 years it is 3 per cent. higher in the last than in the first. On the mean of 40 years pulmonary diseases caused a death-rate of 5.8 per 1000 and contributed 22 per cent. of the total deaths. But they exhibit from year to year all the variations of an epidemic disease as is well shown in the diagram. Thus in 1859 the death-rate was 3.9 per 1000 or 14 per cent. of the total; in the following year it was 6.8 per 1000 or 21 per cent. of the total. The following are years of phenomenal mortality.

Year.	Death-rate per 1000.	Percentage of Total.
1860	6·8	21
1869	7·7	23
1871	7·6	23
1875	7·4	24
1877	7·5	27
1891	6·8	27

If we consider the incidence of the fatality from diseases of the lungs within these years we find that it is seasonal, usually in winter, occasionally in spring, and associated with prolonged frost as in 1860, 1875, and 1877 or with a cold spring with east winds encroaching on the summer as in 1869. Frost in Glasgow is always accompanied with more or less fog which is no doubt the most deadly ingredient of our winters. There seems to be no limit to the possible mortality so long as the cold and fog continue. The most remarkable winter on record for the duration of these conditions was that of 1874-5 when in the seventh week of their continuance the death-rate rose to 67 per 1000, *half of which was contributed by diseases of the lungs*. The fog in this case was more remarkable for density than the frost for intensity. The high pulmonary mortality of 1891 is associated with Influenza. Indeed the taint of this mysterious disease pervades the whole of the last quinquennium—a fact which affords the only crumb of comfort in our review of the movements of this section of Glasgow mortality. If we have lost nothing even under this heavy handicap may we not hope to gain very decidedly when running without weight? The following is a quarterly note of the deaths attributed to Influenza during each of the last 5 years. The gravity of the figures lies not in their amount but in the fact that they are a mere index of the associated addition to the mortality from pulmonary and also from miscellaneous diseases.

	1890	1891	1892	1893	1894
1st Quarter	15	16	77	12	35
2nd do.	6	28	17	9	12
3rd do.	4	13	4	4	4
4th do.	2	115	9	59	12
Total	27	172	107	84	63

The proverbial "bolt from the blue" is unknown in sanitary matters. The epidemic springs from the ever-present ever-active violation of the laws of health. We are a catarrhal, coughing, expectorating people, because we live in a huge industrial city, situated at the seaward end of the trough of a valley, which from one end to the other is covered with smoke, drifting in wreaths and clouds with the wind or in calm filling up the trough so that nothing is to be seen between the higher ground on either side but a sea of smoke. Living thus we live constantly on the edge of a catastrophe. Whenever the scavenging of the air is interrupted by calms so that the smoke product accumulates the atmosphere of our streets thickens and the daylight becomes twilight. If a slight wind shifts so as to fold over and double the coverlid of smoke, then at mid-day we have midnight. Smoke not only loads fog with impurity but tends to produce fog as Mr. Aitken has shown. When therefore in the winter we happen upon a low temperature, a high barometer, and a dead calm we have an Arctic night with a mephitic, irrespirable atmosphere, in which we move about choking, our eyes irritated, our faces grimy—" a purblind race of miserable men." It is then that our pulmonary mortality is run up and the death-rate of the year determined. Now-a-days the undulations of mortality depend more upon our artificial local climate than upon the rise and fall of zymotic epidemics. In the middle of the catastrophe we are helpless; as helpless as people who persist in living on the skirts of Vesuvius are when the eruption begins. If we had no winters, no fogs, no interruption of aerial scavenging, then we might continue our profligate production of smoke and suffer no great inconvenience or injury; but we must anticipate anticyclonic conditions and we ought as reasonable beings to live at all times so that it may be possible to survive them. Glasgow Fair gives us an annual objection-lesson. If it fell on a time of winter-fog we should find our streets full of a thin mist no more irrespirable than the mist on the mountain side. It may be too much to hope for such entire freedom from smoke, but in that direction lies the future reduction of our death-rate. We are approaching a point when advance will be impossible in any other direction. If we must have smoke it is well there should be no misunderstanding as to what it will cost us. How is smoke prevention to be gone about? Firstly by making up our minds that it is possible; secondly by making up our minds that it shall be done, and thirdly by resolute pegging away at the doing. Smoke is a nuisance and nuisances are all alike in this—they can only be suppressed in detail by never-ceasing vigilance and effort. As to domestic smoke, the encouragement of the use of gas in place of coal will probably go as far to mitigate it as any single measure which can be mentioned. There are a host of miscellaneous comparatively paltry sources of low-level smoke which ought to be summarily suppressed. It is quite a mistake to tolerate any smoke-production at a low-level in a city, however trifling. Smoke-suppression is a matter of detail. As to industrial smoke, still smoke-suppression is a matter of detail. Each case ought to be dealt with on its merits, but smoke there must not be.

There is so much analogy between smoke and the condition of the Clyde as questions of health that the one suggests the other in the consideration of atmospheric impurity as a cause of disease. The practical importance of smoke in deteriorating the physical conditions of health is limited to certain times and seasons, so also is that of the Clyde. When the temperature is low, when rain is falling and the volume of water is constantly high and floods are frequent, when there is wind, especially easterly, then the discharge of crude sewage into the Clyde though slovenly can scarcely be called culpable from our present standpoint. But when we fall upon seasons of prolonged drought, high temperature and calm or gentle airs, especially westerly, which are as usual concomitants of summer and autumn as the conditions of fog are of winter, then the Clyde becomes a serious ingredient in the complex influences which depreciate the health of Glasgow. In such circumstances the peculiar odour of the river is perceptible even in the Bridgegate, while in the normally purer air of the regions West of the Kelvin it is obtrusive even in Great Western Road and Dowanhill and befouls the air of Partick and Whiteinch. The question in what direction to look for the effects of the Clyde cannot be precisely answered. The fact that septic poisoning is now recognized as a cause of certain grave inflammations of the lungs warns us against dogmatism as to the category of disease to which air laden with the products of decomposition is likely to contribute. Popular bias would point to diarrhœal diseases as more likely. In either case it is perfectly impossible to isolate statistically or otherwise the part played by an ingredient distributed in the universal air in the production of diseases which have so many possible causes as either pulmonary or diarrhœal disease. There is no doubt that in the pollution of the Clyde we have a condition which in certain combinations of circumstances which may arise within the six months from May to October of any year may manifest a quite unmistakable potency for mischief. If we cannot be guided by general principles in dealing with the Clyde then general principles are of no use whatever in sanitary practice.

Miscellaneous Unclassified Diseases.—This contains the large remainder of disease which does not fall within the category of Zymotics or Diseases of the Lungs and Phthisis.

For the most part it is open to the influence of sanitary operations only through the measures directed against the specified diseases, partly because these measures cover the whole area of the physical conditions of health, but partly also because into this miscellany of disease fall what may be called the pathological debris of infectious and pulmonary disease. The basement of the general diagram shows this residual portion of the death-rate from year to year. In the following Table it is given for periods of 5 years and 10 years :—

Period.	Deaths.	Death-rate per Million.	
		5 Years.	10 Years.
1855-59	24,777	13,425	13,121
1860-64	25,989	12,817	
1865-69	28,106	12,597	12,692
1870-74	31,346	12,787	
1875-79	30,684	12,170	12,113
1880-84	31,253	12,055	
1885-89	31,551	11,588	11,566
1890-94	36,409	11,544	

There has been an extremely gradual movement downwards in the fatality of miscellaneous diseases throughout the 40 years, so gradual that the difference between the first 5 years and the last is only 14 per cent. and between the first 10 years and the last only 12 per cent. The highest death-rate is that of the first year of the 40, viz.—14.1 per 1000; the lowest is that of the last year of the 40, viz.—11 per 1000, a range of variation which is much less than that of any of the special classes of disease previously discussed. Relatively to these classes of disease, the miscellaneous diseases contribute an increasing proportion of the total deaths—50 per cent. in the last decade in place of 43 per cent. in the first. Two deductions lie on the surface of these facts. (1) That in the miscellaneous diseases we find the great substantial mass of our mortality and (2) that while absolutely this mass is contracting, relatively to the total mortality it is increasing. This is the necessary result of the interaction of two factors, one of which tends to take from, the other to add to, the deaths from miscellaneous causes. Towards these gravitate many of the lives maimed by Zymotic disease and in larger numbers those in whom pulmonary diseases becomes chronic, so that any mitigation in the prevalence of these diseases necessarily diminishes the number of deaths attributed to diseases which are ultimately classified as "Miscellaneous." On the other hand, as death is the inevitable end of all, any relief of the infant, the youth and the adult from the ravages of diseases which lay violent hands upon the mechanism of life must add to the number of those who pass into old age and finally drop from the effects of ordinary wear and tear upon that mechanism. In these circumstances it is satisfactory to record even an absolute diminution in the death-rate from miscellaneous diseases. We must look within this category for a considerable proportion of the fatal results of our prevalent pulmonary disease, so that the sum of the effects of the causes which we have so pointedly referred to in discussing diseases of the lungs will be greatly underestimated if we take account only of deaths directly ascribed to those diseases. Very little pathology is necessary to make this clear. In the cycle of organs through which the blood circulates, and which must co-operate otherwise a strain will come upon one or other, there is none more important than the lungs. The heart feels resistance there at once and the effort to overcome the resistance leads to disease in that organ. Then may follow disease in any member of the cycle of coadjutors, or in any organ of the body. Out of our pulmonary catarrh spring diseases of the heart, liver, kidneys, brain, &c., all of which go to swell the mortality from miscellaneous diseases. Not only so, but while extreme cold is the natural enemy of the enfeebled whether from age or disease, and inevitably in the winter they die in increased numbers, to all such and to many more who have weakened hearts, diseased blood-vessels and other organic flaws and who with fair-play would see more years, the city fog is like sand thrown into a piece of machinery, it increases the friction and the wheels of life stop. The truth of all this is written large upon the sympathetic movements of the death-rate from Diseases of the Lungs and from Miscellaneous Diseases. I have pointed out the exacerbations in the pulmonary mortality in 1860-69-71-75-77 and 1891, and it will be found that in every one of these years there is a coincident rise in the mortality from miscellaneous diseases. All those facts go to make broader the grounds of my statement that it is mainly from diseases of the lungs that future reductions of the death-rate of Glasgow must be sought.

(2) *The History and Circumstances of a Peculiar Outbreak of Febrile Disease in St. Mary's Roman Catholic Industrial School for Boys, Glasgow, March, 1888.*

On the evening of Friday, 2nd March, a boy, aged 15, an inmate of St. Mary's Roman Catholic Industrial School for

Boys, Abercromby Street, Glasgow, complained of headache, and was sent to bed in his dormitory. Next morning he rose with the other boys and made his bed, but being observed to be very unsteady on his legs was sent to the sick-room, where he died at 8 a.m. On 3rd March another boy, aged 14, complained of headache, and was sent to the sick-room, and put under treatment. On the 5th, at 1 a.m. he became very delirious, and had to be held down in his bed. He was chloroformed and an enema of 20 grains of bromide of potassium administered. At 3 a.m. the convulsive movements ceased, and he seemed to fall into a natural sleep, but sunk and died at 4 a.m. At 5 p.m. on the 7th another boy, aged 11, reported himself ill, having vomited shortly before, and was sent to bed in his dormitory. The Superintendent's wife found him asleep about 6 p.m. A boy sent with tea could not rouse him, and he died comatose at 8 p.m. On the morning of the 8th, when the occupants of the middle dormitory were being awakened, a fourth boy, aged 14, was found to be unconscious, and by a quarter-past 6 he was dead. Only the second of these four boys had been seen by the Medical Officer of the Institution. These mysterious events, and the fact that 19 other inmates were more or less ill, led him to report the outbreak at the Sanitary Office on the morning of the 8th March; and 12 of the more serious cases were in the afternoon transferred to a separate ward in the Fever Hospital, Belvidere. On the 9th, 14 new cases occurred; on the 10th, 5; 11th, 8; 13th, 2 boys and 2 girls. These were the only inmates of the Girls' Department who were seized. They were employed in the kitchen in which the food for both departments was prepared. Further reference will subsequently be made to their case in discussing the causation of the outbreak, in which the immunity of the Female Institution is a cardinal point. After an interval of two days, 1 boy became ill on the 16th March; on the 17th, 2; 18th, 2; 19th, 1. There was then a clear interval of two days, followed on the 22nd, 23rd, 24th, and 25th by 1 case each day. On the 26th, 2 fell ill; on the 27th, 1; and on the 29th, 1. This makes a total of 66 boys and 2 girls, the number of inmates being 207 boys and 194 girls. Of these 29 boys and 2 girls were removed to Belvidere, and 37 (including the 4 fatal cases) were allowed to remain in the Institution.

Before proceeding to give a short statement of the chief clinical and pathological features of this disease, it is only right to remark that the difficulties in the way of obtaining the facts were great, and were but partially overcome. The arrangements for treating the sick are very defective. No records are kept of the history, symptoms, and treatment of patients. The meagre facts given as to the four cases of sudden death were got from casual observers, only in one case supplemented by medical observation. The children are very dull and stupid, and practically contributed nothing to the subjective information. On the afternoon of the 8th March two trained nurses were got from the Glasgow Sick Poor and Private Nursing Association, one or other of whom was always on duty and took temperatures and made short notes of symptoms. The 19 children who are said to have sickened on the 8th means more probably all who took ill along with the fatal cases, and were at that date found ill. The numbers given afterwards are however correctly assigned. The more severe cases, in which the temperature was above 100 deg. at the outset, including 12 of those found ill when the outbreak was reported, were transferred to Belvidere, where careful notes were taken by Dr. W. W. Christie. As he intends to make these the subject of a paper, I shall only make such use of them as is necessary to present the main general diagnostic features. Of the mild cases retained at the Institution, I have the nurses' notes, supplemented by my own observations, which more or less embraced all the cases. I shall therefore give separately a short account (1) of the post-mortem appearances in two of the fatal cases; (2) of the symptoms in the 31 severe cases treated at Belvidere; (3) of the symptoms in the 33 mild cases kept at the Institution.

1. *Post-mortem Appearances.*—The bodies of the first two fatal cases were interred without examination. This is specially to be regretted in the second case, in which the illness lasted two days, and there was therefore time for the development of more marked lesions. The examination of the other two bodies was made by Dr. Joseph Coats, Pathologist to the Western Infirmary, on 8th March. The following are his reports:—

"Dennis M'Guire, aged 11 years; died 7th March, at 8 p.m., after 3 hours of acknowledged illness. Rigor mortis well developed. Arms, lateral aspects of chest and neck present a livid colour, very deep on left ear; very little lividity of lower limbs.

Brain shows a certain dryness of the surface, but there is no hyperaemia of membranes and no exudation. The ventricles are not distended, and the brain substance is of normal consistence.

Heart.—The blood in heart and body generally is perfectly fluid. The heart itself is normal.

Right Lung.—Firmly adherent, and there are some old condensations at apex; at root of lung some enlarged and slightly caseous glands.

Left Lung.—Non-adherent and otherwise normal. There is no condensation in either lung.

Right Kidney.—Extremely hyperaemic.

Left Kidney.—Similar.

The Bladder is greatly distended with urine, fundus reaching above umbilicus.

The *Liver* presents nothing remarkable.

The *Spleen* is considerably enlarged and hyperaemic. The Malpighian bodies are remarkably prominent.

In the lower part of *small intestine* there is a distinct but not very considerable enlargement of solitary follicles and Peyer's Patches. There is no special hyperaemia of them.

Mesenteric glands are distinctly enlarged and slightly red. No degeneration or sign of tubercular lesion.

Bernard M'Kenna, aged 14 years; died at 6.15 a.m. on the 8th, having gone to bed apparently well and been found dying when the boys were being awaked half-an-hour previously. Rigor mortis well developed. Bluish colour over entire posterior aspect of body and on right lateral aspect of trunk and lower limb. There is also a blue mottling over the lateral aspects of trunk and neck.

Brain.—Membranes present a moderate degree of injection, but there is no exudation, and the brain in general is normal in appearance.

Heart.—The blood in heart is partly coagulated; heart normal.

Both *Lungs* are somewhat adherent, but otherwise normal in appearance.

Spleen is somewhat enlarged, but not markedly hyperaemic. The Malpighian bodies are unduly prominent, but not so markedly as in other case.

The *Kidneys* are moderately hyperaemic, right more so than left, but neither so much as in other case.

Mesenteric glands are much enlarged, but not generally red. They present no degeneration or sign of tubercular lesion.

In the *small intestine* there is a general enlargement of the solitary follicles and Peyer's Patches, but it is not so great as in the other case.

Microscopic Examination.—Portions of the spleen, mesenteric glands, intestine, and brain were removed from both cases and prepared for microscopic examination. Nothing special was revealed by this examination, and, in particular, no micro-organisms were discovered."[1]

---

[1] Dr. Maylard made culture experiments with the blood of seven of the Belvidere patients, but with negative results. Micrococci were found in four cases, but different in all, and probably of external origin. In the remaining three cases nothing was found.

2. *Symptoms, &c., in 31 Cases treated at Belvidere.*—(1) Invasion sudden. Headache was invariable and in many violent, frequently with nausea or vomiting; in a few cases rigor; in 3 sore throat. Pain in one or both sides was general. Occasionally there was drowsiness approaching to stupor. There was delirium in 2 cases; the face was flushed and signs of vascular excitement more or less obvious. Temperature taken on first declaration of illness always increased, in many cases as high as 103 deg., 104 deg., or even 105 deg. In one case it rose from 102.6 deg. to 105.8 deg. in the first 2½ hours; in another from 101 deg. to 105.2 deg. in 3 hours; in another from 102 deg. to 104.5 deg. in 4 hours; in another from 102.8 deg. to 104.2 deg. in 1 hour. (2) There was more or less cough at some time during the course of the illness in all cases but 1, in which, although the temperature ran up to 104 deg., there were absolutely no chest symptoms. Pneumonia was distinct in 17 cases, in all but 1 unilateral; doubtful in 8 cases—always limited in area. There was distinct catarrh of the air passages in 4 cases. (3) Herpes was present in 13 cases, sometimes appearing at the very outset. (4) The spleen was enlarged in 5 cases. (5) Chlorides in urine were slightly diminished in 9 cases. (6) Eruptions on body. Urticaria in 1 case. "Dusky spots and mottling on thighs" in 1 case. "Eruption probably due to irritation of flannel" in 1 case. "Taches bleuatres" in 1 case. Purpuric spots on legs during convalescence in 2 cases. (7) All the cases recovered. There were no deaths excepting the 4 in the Institution at the outset. The highest temperatures noted were 106 deg., 106.2 deg., and in 2 cases 106.4 deg. In all, the temperature rose at one time or another above 100.6 deg.; in the greater majority above 103 deg. Pain in the joints, in 1 case with effusion, occurred in convalescence, in 5 cases. Recovery always perfect, and, when there was no lesion of the lungs, rapid, in view of the high fever and prostration. The average duration of febrile temperatures was 7 days; the average residence in hospital of the 17 distinctly pneumonic cases was 35½ days; of the 8 doubtfully pneumonic cases, 34 days; and of the 6 uncomplicated cases 26 days.

3. *Symptoms, &c., in 33 Cases retained at the Institution.*—Invasion sudden. Headache and sickness almost always the first cause of complaint, usually with more or less pain chiefly referred to right side. Distinct drowsiness in 8 cases. In 7 cases temperature slightly above 100 deg., in 1 as high as 104.8 deg. for a few hours; in remainder never above normal, or only some fractions of a degree between 98.4 deg. and 100 deg. In short periods, from a few hours to two or three days, health was perfectly restored, frequently after deep sleep and per-

spiration. In 1 case there was diarrhœa. In some cases, especially after the alarmingly sudden deaths, fear might account for the condition of the boys, but, as a rule, the general aspect of these mild cases suggested a striking family resemblance to the severe cases, and a common origin or affinity. To one accustomed to see the *whole area* of epidemic outbursts, those retained at home as well as those sent to hospital, those who did not think it necessary to have medical aid as well as those who did, the aspect of this outbreak was exactly the same. There was the black centre of fatality, shading off outwards through the severe cases into the mild cases, and ending in a region of slight deviation from health which, dissociated from the central events, would have been misnamed or have escaped notice. Nothing was more striking with regard to these mild cases than the suddenness with which the patient plunged from perfect health into the disease and emerged with equal suddenness into health again. The uncomplicated cases in hospital presented the same characteristic. A boy would take a hearty meal; become sick within an hour thereafter; his temperature taken at once might be up to 103 deg.; and his aspect one of utter prostration; within the next twenty-four hours it might reach 105 deg.; within a few hours more return to normal; and forty-eight or sixty hours from seizure he might be at the dinner table again!

The key to the discovery of the cause or explanation of this outbreak of disease is the limitation of it to the inmates of one of two kindred Institutions occupying different and structurally separate buildings placed side by side, one a little north of the other, viz., the Boys' Industrial School. The disease began there on the 2nd March, and had run two-thirds of its course there, when on 13th March, two girls were seized, the first and only cases on the female side. The two Institutions are worked together like one family. All the washing is done by the girls in one washing-house—all the cooking in one kitchen. There is a common larder, a common dietary, and a common dining-hall, into which the boys are marched to eat the meals cooked and set out by the girls, who clear away the dishes and set the table again for themselves. In this way there is an amount of intercommunication, which in the case of an infectious disease, such as typhus, scarlet fever, or smallpox appearing in one Institution, soon gives practical demonstration of reality. In all my dealings with St. Mary's Industrial Schools this has been a source of anxiety, as it was on the present occasion. These two girls were both employed in the kitchen. One of them a sister of one of the 19 boys found lying ill on 8th March. Their mother had visited her son in the boys' sick-room, and on two occasions was allowed to see her daughter immediately afterwards. As regards the other girl there was no element suggestive of infection, excepting employment in the kitchen. Both had pneumonia—the one unilateral, the other bilateral—and, in fact, but for the association would have been regarded as cases of inflammation of the lungs, due to exposure to alternations of heat and cold incident to their employment, at a time when the wind was due E. and the mean daily temperature averaged 32.5 deg. As already stated, no other cases of sickness appeared among the girls. These two cases therefore remain on record as cases of pneumonia, which may either be regarded as isolated in causation or associated by infection with the outbreak among the boys. In either case, what we endeavour to explain is an outbreak of disease confined to the boys.

The circumstances described as to the internal economy of these Institutions at once exclude anything connected with food from the possible causes. In material, preparation, and distribution, everything was common to both. Nevertheless inquiry was made as to the source of the milk supply, especially as to pleuro-pneumonia among the dairy stock; but, both as to quality and possible contamination, the milk as well as all other articles of food supply were found to be unimpeachable. The food seemed to be well cooked and the dietary sufficient.

Was the disease confined to any section of the inmates of the Boys' Institution, as to age, employment, or dormitory? (1) *Age*—The average age of the 33 boys who were retained in the Institution (excluding the fatal cases) was 12 years; of the 29 removed to Belvidere, 11.8 years; of the 4 fatal cases 13.5 years; of the remaining 141 boys who were not affected, 12.4 years. Contrasting those who were attacked with those who were not attacked, the average age of the former was 12 years; of the latter 12.4 years. Classified as to gravity, the average of the severe cases (*i.e.* the 4 fatal cases and the 29 sent to Belvidere) was 12 years; of the mild cases, 12 years. The only indication given by these figures is that those who escaped were the oldest, but of those attacked the oldest died. (2) *Habits*—The fact that the first and fatal cases were among the older boys (viz. 15, 14, 14, 11) gave support and currency to the opinion entertained by all the officials of the Institution that tobacco-chewing was the cause of the whole affair. It is stated that these lads were all tobacco-chewers. The other fact, that those who escaped were older on the average than those who were seized, bears in the opposite direction; but the tobacco theory must be rejected for much stronger reasons. A narcotic could never give rise to a febrile disease. Even the officials could not assert that every boy attacked was a tobacco-chewer, and when put to the boys individually some who admitted their personal failing supported others in their assertion that they did not chew. In any case this practice, which undoubtedly to some extent prevails among the boys and is unknown among the girls, takes its place among other more important differences, tending to a lower standard of health among the boys, to which we shall afterwards allude.

(3) *Employment in the Institution.*—Both Institutions are conducted on the half-time system, *i.e.* the one-half of the inmates is in school while the other half is in the workshop, sewing-room, washing-house, &c., and the half in the schoolroom in the forenoon is in the workshop, &c., in the afternoon, and *vice versa*. The bearing of this method is that any insanitary condition within the Institution affecting the schoolroom or playground is common to all inmates of each Institution apart, just as the dining-hall and food are common to all inmates of both Institutions together. (4) *Workshops, &c., and Dormitories*—Here there is a rigid division, so that any insanitary condition in a workshop or dormitory might tell on one section of the boys. The following Table shows the distribution of the boys as to employment and dormitory:—

	Trade.						Dormitory.		
	Firewood.	Paper-Bag Making.	Tailor.	Shoe-making.	Nothing.	Miscellaneous.	Top.	Middle.	Low.
Died, - - - -	1	...	...	2	1	...	1	1	2
Removed to Belvidere,	11	5	3	4	6	...	9	4	16
Treated at Institution,	9	5	6	1	11	1[1]	12	13	8
Not attacked, - -	63	16	20	12	25	5[2]	47	51	43
TOTAL, - -	84	26	29	19	43	6	69	69	69
Percentage attacked, -	25	38	31	37	42	17	32	26	38

[1] Van-boy. [2] 2 Door-keepers, 2 Engine-boys, 1 Infirmary boy.

No set of boys was exempt; though all did not suffer in the same proportion. Those employed in the manufacture of fire-lighters were most exempt, but those who had no special employment suffered most. Those sleeping in the middle dormitory were most exempt. Still we may conclude that, whatever the noxious influence was, all in the Institution were exposed to it. There may have been some subordinate modifying circumstances connected with the conditions under consideration, but it is equally possible that the different results in those sections of the boys were accidental.

The site of these Institutions is one which is utterly unsuited for the residence and upbringing of children, especially children who have inherited impaired constitutions and are the waifs of a large city. It is in the centre of a populous working-class district—within a block, surrounded by four-storey tenements and workshops, in the midst of which is a graveyard, which was opened in 1839. Its extent is 5333 square yards. In a printed Report on the Burial Grounds of Glasgow by the late Sanitary Inspector, dated 1875, he says :—"Notwithstanding its recent erection, this cemetery is greatly overcrowded with bodies, and kept in a state of rank disorder. Orders for 390 interments were granted during the past six years. The common ground, containing the remains of many who died of cholera (in 1848), has been covered with earth to a depth of six feet, for the purpose of forming accommodation for new interments, some of which had been made before the sheriff's restriction." This refers to the fact that the graveyard was closed by order of the Sheriff, at the instance of the Local Authority, along with other intramural burying-grounds, in 1870. Permission has, however, since been granted by the Local Authority to inter near relatives of lairholders in this as in the other cemeteries. Up to 1875, as stated above, the number of interments thus made amounted to 390, and since to the following number in each year, viz. :—1875, 39 ; 1876, 26 ; 1877, 19 ; 1878, 23 ; 1879, 17 ; 1880, 15 ; 1881, 7 ; 1882, 3 ; 1883, 9 ; 1884, 7 ; 1885, 5 ; 1886, 10 ; 1887, 4 ; up to date of outbreak, 3 ; a total of 187 bodies. On the western verge of this graveyard a Convent was erected, which was in 1862 transformed into an Industrial School. In 1868 a separate school for boys was built to the north. They are therefore shut up with this graveyard inside a barrier of dwelling-houses in flats, and public works, which extend continuously round the W., N., and E. sides, the south-side being partially closed in by a large Roman Catholic Chapel and Day Schools. The situation of these Institutions has been repeatedly condemned in official Reports by H.M. Inspector of Industrial Schools and Reformatories.

Such being the insanitary conditions which surround both Institutions alike, let us compare their internal arrangements, especially as to area and capacity. The number of inmates is of course a cardinal datum for comparison. The boys' division is licensed for 200 ; the girls' for 190,[1] but there were

---

[1] Recently increased from 175 on the extraordinary plea that a play-shed had been provided !

207 boys and 194 girls at the time to which this inquiry refers. It is obvious that these numbers are frequently exceeded, especially on the boys' side. Thus, the Government Reports give the average number of inmates in 1878, 247 boys and 204 girls; in 1879, 241 boys and 214 girls; in 1880, 246 boys and 212 girls; in 1881, 242 boys and 208 girls; in 1882, 240 boys and 202 girls; in 1883, 231 boys and 189 girls. I shall take the number of beds in the main dormitories of each at this time as a fair standard, viz., 210 for boys and 190 for girls, excluding the sick-room beds in each case.

Superficial Area.—The Master of Works informs me that the entire area occupied by the Boys' Institution is 1470 square yards; by the Girls', 1960 square yards. This gives 7 square yards per head for the boys and 10.3 square yards for the girls. He also states that of this there is open space, available for play-ground, 600 square yards for the boys and 800 for the girls, or nearly 3 square yards per boy and 4.2 square yards per girl. But while the boys have no covered play-space for wet weather, the girls have a cloister, which can be shut in entirely, with an area of 240 square yards. This raises the available play-space for the girls to nearly 5.5 square yards per head, against 3 for the boys. In winter, in the evening, before going to bed, and on Sundays, in bad weather, all the boys are put into the school-room, where they have 108 cubic feet and an area of 9 square feet per head, encumbered with forms and desks.

Cubic Space.—I have had the cubic contents of every apartment used by the inmates of each Institution measured. The details will be found in the Appendix (Table 1.). I do not include the Dining Hall, which is in the Female Institution, because it is used by both sides. The *Boys* have an aggregate of 125,312 cubic feet, the *Girls* of 135,295 cubic feet, or 597 and 712 cubic feet per head respectively. In each of the three Male Dormitories there are 70 beds, which gives 385, 372, and 367 cubic feet per head in the low, middle, and top dormitories respectively, or an average of 375 cubic feet.

The *Female Dormitories* are four in number, among which the 190 beds are thus distributed: 60 with 374 cubic feet each: 48 with 275 cubic feet each; 41 with 259 cubic feet each; 41 with 288 cubic feet; the average being 306 cubic feet. This is the only part of the accommodation in which the boys have more space than the girls. In the *Boys' School-room*, used by half the inmates at one time (105), the space per head is 216 cubic feet; in the Girls' (95), it is 254 cubic feet. *The Boys' Sick-room* is a small bedroom, containing 2694 cubic feet, in which 4 beds are placed usually, but as many more are added on occasion as the floor will hold. *The Girls' Sick-room* measures 5044 cubic feet with 5 beds. This gives 673 cubic feet or less to the sick Boys', and 1008 cubic feet to the sick Girls. The Girls' Sick-room is also much better suited for the purpose, having 3 windows as compared with 1. In neither Institution is there a *mortuary*. The bodies on which the post-mortem was made on the 8th March were placed in what seemed to be a bedroom used by attendants, on the same landing as one of the dormitories. I have since attended a post-mortem on the girls' side, and the body was in a closet next to the sick-room, used as a drug-store, and lighted only by a skylight! It certainly seems remarkable that such arrangements as those described for the sick and the dead should be tolerated in Institutions under Government Inspection.

General Sanitary Conditions.—At the time of the outbreak all the wall surfaces in the Boys' Institution were conspicuously dingy and in want of renewal, while on the Girls' side they were fresh and clean. The *Privy* in the Boys' courtyard is an iron trough privy in which the faeces accumulate, and were flushed out every second day and removed by the Cleansing Department. I ordered this to be done every day. The Privy in the Girls' courtyard is also a trough privy, but it is flushed out at least three times a day into the drains by the attendants. It is consequently much more cleanly and wholesome.

The difference between the *lavatory arrangements* in the two Institutions is also important. The boys' lavatory is a cold, damp, uncomfortable-looking place, without hot water at the taps, situated in the courtyard. To turn lads of low vitality with weak chests, out of their warm dormitories to perform their ablutions there at 6 o'clock on a winter morning must be dangerous. The girls have washing places convenient to their dormitories on the same landing, where they are not exposed to chills.

The *drains and soil-pipes* of the girls' school were thoroughly overhauled and rectified under the supervision of this Department in the Spring of 1886, after an outbreak of Typhus Fever. In March last, after the present outbreak, the whole drainage system of the Boys' Institution was tested and inspected, and the following is Mr. Fyfe's report of the result :—

"*13th March*, 1888.

"The drainage system of the boys' workshops, school, and dormitories was smoke-tested to-day.

"The following are the defects which were noted :—Smoke issued in the W.C. attached to the dormitory in the top flat, and from the joint at the top of the window outside : also in the W.C. apartment attached to the dormitory immediately beneath this, apparently from defective fittings at the jawbox.

It also came up in considerable volume in the small private washing-house on the opposite side of the court.

"The sink in the closet attached to the lowest dormitory is connected to the soil-pipe below the seal, and the ventilation of the soil-pipe is insufficient. Inside of the seat of this W.C. filth and dirt were found in considerable quantity. Below this W.C. and bath apartment is the boys' lavatory, a long chamber having iron basins ranged along side. There are six bell traps in this chamber. Two were lifted, and both were found to be choked with dirt, and consequently inoperative. An old disused waste pipe, four inches diameter, was found connected to the main drain, running out to the south of the dormitories. It was built about two feet into the wall, and was quite open. *The main drain was thus being partially ventilated into the stones and mortar of the gable at the south end of the school-room.* At this end of the building, just at the stairs leading towards the south, the ground was opened. The soil and sand turned up were teeming with large white worms, which were crawling about in every direction. I understand that coffins containing human remains were found some time ago in the court attached to the girls' portion of the school when a portion of it was being dug up to lay the drains.

"The steam pipes which heat each of the three dormitories are connected to the drains, so that hot water and steam are discharged therein during heating time. This, of course, ought to be discontinued.

"I got a portion of the floor of the centre dormitory opened. The deafening is composed of ashes and builders' refuse, viz. lime stones, sticks, &c. Cobwebs were formed among portions of it; but no offensive smell could be felt. No ventilation is provided underneath the flooring of any of the dormitories.

"The main soil pipe from the water-closet attached to the dormitories is connected to the back gutter, and takes off the rain water. This soil pipe should be carried up full bore three feet above the roof, and a separate rain conductor ought to be erected in order to take off the roof water. The main drains are very deep, and quite inaccessible.

"(Signed) PETER FYFE,
"Sanitary Inspector."

Addenda, 14th June, 1888.

"Drain pipes in cellar under boys' lavatory were open at the joints, and all the bell traps in lavatory choked; also, soil pipe of W.C. (on left of passage leading through the main building to back court) was defective.

"All the defects in the drainage are now made good.

"The steam and hot water from the heating pipes are still discharged into the drains, which will assist in the rapid decomposition of the sewage, and the quick formation within the purlieus of the buildings of offensive gases.

"Nothing has been done to warm the boys' lavatory, which must be a chilling spot in the winter time.

"P. F."

The health record of these Institutions is bad. In the Annual Reports of the Government Inspector of the Certified Reformatory and Industrial Schools of Great Britain, the first of which appeared in 1858 for the year 1857, we find evidence of this fact and of its association in the opinion of the Inspector with the radical defect of situation. The Convent, which ultimately became the Girls' School, is first referred to in 1862, and the Boys' School in 1868. The following are a few notes and extracts from the Inspector's remarks from year to year :—

1868. Referring to both Institutions.—"The premises were clean and in good order. The chief drawbacks to them are that the space and opportunity for active exercise are very limited, and that they are so close to a large burial ground still occasionally used." (p. 91.)

1870. *Boys.*—"There was little illness in the house at the date of inspection, but since that time there has been a very serious outbreak of *Smallpox*." (p. 146.)

Girls.—"They looked healthy, bright, and cheerful, but there has been serious sickness in the year. . . . The girls require more air, exercise, and freedom for moral and physical health and growth." (p. 146.)

1872. *Boys.*—"The exercise ground is but small. The children should be taken out for change of air and exercise as often as possible." (p. 160.)

Girls.—"The girls' school was visited by *typhus fever* in the early part of the year. No less than 100 girls stricken at once. Two deaths resulted, and two from consumption. . . . The girls want more air and lively exercise. The situation of the school is not conducive to health. It should be removed to a greater distance from the town." (p. 161.)

1873. *Boys.*—"I found the boys in fair condition of health, though not very robust. They should be taken out for change of air and exercise as often as possible. One death in the year only. A few cases of *smallpox* had occurred without fatal effects among the boys, but the Superintendent's son did not survive the attack." (p. 168.)

Girls.—"The school maintains its internal efficiency. It is not healthy in point of situation. The young children require purer air and a greater amount of exercise and freedom." (p. 169.)

1874. *Boys.*—"Health and general condition—Generally very fair. There had been a serious attack of *fever* in the preceding autumn, and 5 deaths had occurred in the present year, chiefly from lung disease." (p. 196).

1875. *Girls.*—"Health and general Condition—The situation is not a healthy one for children; the girls have rarely enjoyed an average share of good health for any length of time. In the early part of the year there was an outbreak of typhoid (*typhus*) *fever*, affecting 20 girls. These were sent to the Fever Hospital and treated there; this was followed by an attack of measles, 14 or 15 girls were affected. I found the general health restored on the day of my visit, but the physical state of the girls was not quite satisfactory. They want more fresh air and free exercise." (p. 181.)

1880. *Boys.*—"Health and general condition—The children are received in a very feeble condition; the constitution is very indifferent. It is difficult to build them up in strength and vigour. There were 5 deaths in the year. The children suffered a good deal from the cold in the early part of the year. and the deaths resulted chiefly from lung diseases and consumption; 1 from heart disease. The boys looked bright and well on the day of inspection. The medical report was favourable." (p. 236.)

Girls.—"Health and general condition—The health of the children had been much tried since the last inspection. There had been 10 cases of *scarlet fever* and 2 of *measles.* Two deaths in 1880; 1 from consumption. The children on their arrival are very feeble and with constitutions much impoverished. At the time of inspection all the children were well. and very many of them looked blooming and vigorous. A large majority very young." (p. 237.)

1881. *Boys.* — "Health and general condition — The children are very feeble on admission, and in the early part of the year there was a very serious mortality among those recently admitted; they seemed to be too weak to struggle against the severe weather of the early part of 1881. I came to the conclusion that the large dormitories were greatly at fault, and that in the winter it would be necessary to introduce some artificial heat. Ten boys died in 1881. This excessive death-rate demands the most serious attention on the part of the managers. Such a mortality is altogether abnormal, and can be prevented by ordinary precautions, by merely supplying warm clothing, plenty of food, and warm apartments, accompanied with individual care and attention." (p. 239.)

Girls.—"Health and general condition—The girls had a healthy appearance. Several of them suffered from the extremely trying weather of the early part of 1881 from attacks of bronchitis and pulmonary disorders. Only two deaths in 1881; a few cases of ophthalmia. No sick cases on day of visit. Children thriving physically." (p. 240.)

1882. *Boys.*—"Health and general condition—A better medical report this year. Only one death in 1882, against ten in 1881. The winter happily was very mild. Cold is the deadliest enemy of the poor, enfeebled children received. Keep them warm by night and by day, and you may preserve their lives." (p. 256.)

Girls.—"Health and general condition—Very fair. Most of the children looked remarkably well. Two deaths in 1882. A few cases of ophthalmia; some acute cases of bronchitis and congestion of lungs; a little rheumatism also; one case of *enteric fever*. A good many bronchial attacks in the early part of the year." (p. 256.)

1883. *Boys.*—"Health and general condition—A great deal of special attention is now paid to the delicate and the failing. The Medical Officer calls daily. Three deaths in 1883 from lung disease; two suffering from pneumonia at the date of my visit. Many very feeble on admission. A few cases of weak eyes; one from hip-joint disease. Boys generally doing well, bright and active, and with plenty of spirit. Food and clothing apparently sufficient." (p. 270.)

Girls.—"Health and general condition—Many of the girls very young, and when admitted very feeble, and without any constitutional strength. Three deaths in year from lung disease. Children very subject to pulmonary complaints. Children carefully nurtured and very kindly treated. A large number looked healthy and vigorous, well fed and clothed, and of good physical appearance. Very little sickness. Medical report, except as to delicate children, satisfactory." (p. 271.)

1884. *Boys.*—"Medical Report favourable on whole. . . . Several cases of pneumonia, the most fatal in its effects here." (p. 262.)

1885. The Chief Inspector refers to "a very serious outbreak of *typhus fever* at an Industrial School in Abercromby Street, Glasgow, for the reception of Roman Catholic girls." After detailing the circumstances, which are given in quotations below, from Mr. Rogers' Report, he adds—"The situation of the School is not good, being in a low and crowded part of the town, and some of the sanitary arrangements of the building are open to objection." (p. 12.)

Boys.—"Health and general condition—The school is very subject to epidemics. In July, 1884, there was a severe attack of *smallpox*—11 cases. All the boys were vaccinated or revaccinated after the attack. In November, 1884, 11 boys were suffering from *measles*. Several cases of lung disease, a most fatal complaint in this school; several cases of ophthalmia. Boys very feeble on admission, with no constitutional strength; these younger boys need a separate establishment and female care. Four deaths in 1885—a large mortality. No sickness in the house; boys looked fairly bright and active, many very young." (p. 273.)

Girls.—" State of premises—Premises in very good order and repair. One or two of the dormitories open to objection; some alterations required on sanitary grounds. Good laundry and drying-room. Capital play-shed. Yard newly pitched. Much has been done of late to place the school on a satisfactory footing, but the situation is an unhealthy one, and contagious or infectious disease is constantly at its doors."

" Health and general condition."—Several cases of ophthalmia and two cases of rheumatism; several of bronchitis and pneumonia. In November and December, 1884, six case of measles. In the early part of 1885 several cases of bronchitis and pneumonia. In October, November and December, 1885, the school suffered from a prolonged attack of *typhus fever;* there were 65 cases in all. Happily it was of a mild type, but two girls died, and one of the attendants, a Sister of Charity, also succumbed. The outbreak was the subject of special investigation and inquiry. It was probably introduced into the school, but was allowed to get strength before it was fairly grappled with. The premises have been carefully examined, the sanitary arrangements looked into, and measures of prevention adopted. But the school is badly situated, and should be removed into the country. There were five deaths in the year." (p. 274.)

1896. *Boys.*—" Health and general condition—I cannot say that the situation of the school is a healthy one. The boys are constitutionally feeble on admission, and require female care and superintendence up to a certain age. They are very subject to pulmonary complaints, and very often succumb to such attacks. There were two deaths in 1886; one with diseasesd bone of foot, which he was obliged to lose; several cases of pneumonia and bronchitis, in the early part of the year. Boys are properly cared for, and looked bright and cheerful. I saw no indications of neglect; on the contrary, the children are treated with much kindness and attention." (p. 287.)

Girls.—" State of premises—I found that, in consequence of the alarming outbreak of typhoid (*Typhus*) *fever* in the school, in November, 1885, the sanitary condition of the house had been much improved. The whole house had been renovated, the drainage carefully examined, and everything objectionable removed. The dormitories were clean and sweet, new bedding supplied, and the whole house purified and cleansed as far as possible.

"Health and general condition.—The health of the children since the serious outbreak of 1885-6 had been good. One death in the year. The sick-room was unoccupied on the day of my visit. There had been a few rheumatic cases, and some cases of ophthalmia and bronchitis. The children had a healthy appearance generally." (p. 289.)

The burden of all these official reports is the unhealthiness of these schools, their unwholesome position, their repeated invasion by infectious disease which always spreads. This shows want of sufficient air-space both within and without. Pneumonia and other lung diseases are chronically prevalent from the same cause, and especially severe among the boys. Ample testimony is borne to the care bestowed upon the inmates, and to the numerous alterations and rectifications of drainage and other internal improvements, but these do not touch the radical defect of these Institutions, and there has been no real elevation of the general standard of health.

Death-rate in St. Mary's.—In the Appendix[1] will be found a statement compiled from Tables in the Government Inspector's Annual Reports, showing the average number of inmates and the number of deaths in each Institution for the 10 years, 1878-87 inclusive. I have chosen the last 10 years so as to give the Institutions the benefit of all that has been done to improve their condition. The result is that in the Boys' School there have been 36 deaths (*i.e.* 3.6 in an average population of 226.7) or a mean annual death-rate of 15.9 per 1000 inmates; in the Girls' School 25 deaths (*i.e.* 2.5 in an average population of 190) or a mean annual death-rate of 13 per 1000 inmates. For comparison I have also compiled a similar statement from the same source for the Mossbank Industrial School for Boys and the Rottenrow Industrial School for Girls, which was transferred in June, 1881, to Maryhill. These Institutions receive the same class of boys and girls from the same city, the only difference which determines the allocation of these children being one of religion. The result is that in Mossbank Boys' School there had been 42 deaths in an average population of 385, or a mean annual death-rate of 11 per 1000 inmates; in Rottenrow (now Maryhill) Girls' School 12 deaths in an average population of 211.5, or a mean annual death-rate of 5.7 per 1000 inmates. This comparison requires no comment. The extreme unhealthiness of the St. Mary's Institution may be illustrated by another comparison. Taking the Boys and Girls together we find that there have been 61 deaths (*i.e.* 6.1

---

[1] None of these Tables are reproduced.—[Ed.]

in an average population of 416.7), or a mean annual death-rate of 14.6 per 1000 inmates. In the worst district of Glasgow, viz., Bridgegate and Wynds, in the 3 years, 1880-1-2, the death-rate per 1000 of the population between 5 and 20 years of age was 12.5, or 2 per 1000 *less* than this Institutional death-rate of a population aged between 5 and 15 years. The data at my disposal do not admit of stating the mortality for exactly the same period of age, but the inclusion of the five years, 15 to 20, tends to raise the district death-rate quoted, so that the comparison as it stands is favourable to these Institutions, yet this is the astounding result. Taking Mossbank and Maryhill Schools, we find that there have been 54 deaths (*i.e.* 5.4 in an average population of 596.5), or a mean annual death-rate of only 9 per 1000 inmates; which is 3.5 per 1000 *less* than the district death-rate and 5.6 *less* than the St. Mary's death-rate.

The Most Fatal Diseases in St. Mary's.—In the Appendix (Table III.[1]) will be found in detail the registered cause of each death in each Institution in the last 10 years, with the duration of illness and age of patient, all extracted from the Registrar's books. Out of a total of 36 deaths among the boys there were 16 from Phthisis, 6 from Pneumonia and Pleuro-pneumonia, 4 from Congestion of the Lungs, and 1 from Bronchitis. Out of a total of 25 deaths among the girls there were 10 from Phthisis, 3 from Bronchitis, 2 from Congestion of the Lungs, and 1 from Pneumonia. Therefore 75 per cent. of all the deaths among the boys was caused by various diseases of the Lungs, and 64 per cent. of all the deaths among the girls. Combining the two sexes, 70.5 per cent. of all the deaths was caused by Pulmonary Diseases. Again, turning to the most unhealthy district of Glasgow, viz., Bridgegate and Wynds, for comparison, I find that in the three years 1880-1-2, 41 per cent. of the total deaths between 5 and 20 years of age were caused by diseases of the Lungs. Separating Phthisis from Acute Diseases of the Lungs, I find that the comparison stands thus:—

	Institutions.	Worst City District.
Phthisis, - - - -	42·6 per cent.	21·7 per cent.
Acute Diseases of the Lungs,	28 do.	19·3 do.

The rapidity with which some of these diseases proved fatal to the children, especially the boys, is remarkable, *e.g.* Congestion of the Lungs was fatal to a boy of 11 years in 1 day, and Pleuro-pneumonia to boys of 9 years and 10 years in 4 days.

Frequency of Epidemics in St. Mary's.—The quotations from the Inspector's annual reports show that both Institutions have been repeatedly invaded by various epidemics. *Smallpox*—In 1870, in 1873, and in 1884, there were outbreaks of smallpox, on each occasion among the boys. *Typhus*—There have been 3 severe epidemics of typhus, all among the girls. In 1872 " no less than 100 girls were stricken at once," and 2 died. In 1875 there were 19 cases. On that occasion I reported as follows to the Local Authority—" I have had the dormitories in this Institution measured, and find that in all there is a minimum of cubic space, and in one, indeed, positive overcrowding—there being little more than 200 cubic feet per bed. I have addressed myself to the Superintendent of the schools on the subject, and have seen the local agent of the Inspector of Reformatory and Industrial Schools." In 1885 there were 70 cases; 2 girls died and 1 of the Sisters of Charity. *Scarlet fever* invaded the boys in 1873 and the girls in 1880. *Measles* invaded the boys in 1877 and 1884, and the girls in 1875 and 1884. Free intercourse with friends and relatives, and the absence of a probationary ward in which new admissions could spend a period of quarantine before joining the others, make the occasional importation of infection inevitable. Still, if there was no overcrowding and if proper sick-room accommodation existed, the disease thus imported would not spread as it always does. Those epidemics of typhus, which have thrice occurred in the girls' school, are sufficient of themselves to bring discredit upon the Institution.

---

[1] None of these Tables are reproduced.—[Ed.]

Meteorology.—A table showing daily progress of disease, with meteorological data, will be found in Appendix (Table IV.[1]). This outbreak occurred in the spring. The first and fatal cases, on 2nd and 3rd March, were preceded by a period of cold, dry, sunless weather, with east and north-east winds; the mean daily temperature averaging about 36 deg. F. The next fatal cases, on 7th March, occurred after two days of west wind, with rain and mean temperatures of 44 deg. to 45 deg. F. This change continued for the three following days, which produced the bulk of the cases. Then occurred three weeks of east and north-east winds with occasional rain and more sunshine on the whole, but with low mean temperatures, considerably below or but little above freezing and very variable, during which cases occurred, 1 or at most 2 per day, with intervals of immunity. Probably all that can be inferred from these facts is that the weather was trying for weakly children and well calculated to chill the surface and produce internal congestions.

Health of the Neighbourhood.—In the tenements of flatted dwelling-houses surrounding the block containing St. Mary's Institutions, there are 158 dwellings, viz. 38 of 1 apartment;

---

[1] None of these Tables are reproduced.—[Ed.]

85 of 2 apartments; 27 of 3 apartments; 7 of 4 apartments; and the residence of the clergy, 14 apartments; the number of inhabitants being between 700 and 800. In the months of February and March, and April of this year there were *only two deaths* registered in this population, viz., a female, aged 65 years, on 16th April, of pneumonia, after an illness of 10 days; and a male aged 52 years, of phthisis pulmonalis, on 17th April, after an illness of 3½ years. There is therefore no evidence of any coincident disease of the St. Mary's type among those living within a few yards of the Institutions.

Health of the City.—The Registrar-General returns the weekly death-rate and the number of deaths from Bronchitis, Pneumonia, and Pleurisy, in the City, for the six weeks, covered by the Meteorological Table in the Appendix, thus:—

	Death-rate.	Pulmonary Deaths.
Week ending 25th February,	26·9	69
Do. 3rd March,	27·5	76
Do. 10th do.	29·4	94
Do. 17th do.	26·9	72
Do. 24th do.	27·2	71
Do. 31st do.	27·4	77

The week ending 10th March, which was the centre of the St. Mary's outbreak, was, therefore, marked by a sudden and solitary increase in fatality of acute diseases of the lungs, over the whole City.

Summing up the results of this investigation, we find that the St. Mary's Industrial Schools are situated in a densely populated district of the City; that they are enclosed by surrounding tenements and other large buildings, along with a graveyard which was in 1875 described as "greatly over-crowded with bodies, and kept in a state of rank disorder," and in which have since been interred 577 bodies; that the free space attached to both, and available for exercise, is small; that the internal air-space in both is deficient; that the inmates are children between 5 and 15 years of age, who are the waifs of a large city, weak in constitution, tainted with a proclivity to scrofulous diseases, and generally of low vitality; that the death-rate is in both higher than that of other Industrial Schools which receive the same class of Glasgow children, and higher than that of children of the same age living in the lowest district of Glasgow; that the proportion of the total deaths caused by pulmonary diseases is enormous, and higher than among children of the same age in the worst district of Glasgow; that, in the words of the Government Inspector, "contagious or infectious disease is constantly at their doors," and especially that there have been repeated epidemics of Typhus Fever, a certain indication of, and attendant upon, overcrowding. This is the sanitary status, and the vital results associated therewith, as regards both institutions; but comparing one institution with the other, we find a marked difference to the disadvantage of the boys' school—a difference of such a kind as to suggest a probable explanation of the event for the cause of which we are in search. The overcrowding is much greater in the boys' than in the girls' school, *i.e.* the external free space is much less, the internal air space is much less per head; the internal arrangements are more defective, the accommodation and general sanitary condition of the building inferior; the general mortality among the boys is higher; the proportion of the total deaths caused by pulmonary diseases, and especially by acute diseases of the lungs, is considerably higher. The outbreak of March was in its nature a febrile disease, tending to implication of the lungs, and especially to pneumonia. It seems identical with a disease which has been observed in other similar institutions, more or less detailed accounts of which will be found at the end of this report, in all of which the observers had a difficulty in assigning it a place in nosology, but in all of which it was associated with insanitary conditions of the nature of aerial contamination. It suggests a specific poison, from family resemblance in explosive character, local limitation, and clincal features, to other well-known typical diseases of the epidemic and infectious class. No specific micro-organism was discovered in this, or has been, so far as is known, in any other like outbreak. The rapid fatality in the fatal cases shows that this poison, though in the cases in which life was not at once extinguished, it tended to expend itself upon the organs of respiration, was the cause of the disease. The local disease was the result of a constitutional infection, which was capable of killing without the local disease. The *post-mortem* appearances pointed to a specific poison allied to that of enteric fever. Such as they were, they were distinctly lesions of the mesenteric glands, and of the glandular system of the small intestines. The experiences of the Fever Hospital is strongly suggestive of a casual affinity between certain forms of pneumonia and enteric fever. The two diseases are frequently confused, both in their diagnosis and local incidence. This observation, as well as the present epidemic raises a strong suspicion that we must enlarge our conceptions of the morbid manifestations which are to be regarded as proof of the influence of air contaminated with organic effluvia. If so, we can no longer hold that the absence of enteric fever warrants us in concluding that known impurity of the air from sewage emanations, for example, is innocuous. The prevalence of acute pulmonary diseases may be the result. The presence of " Pythogenic Pneumonia " and

"Epidemic Pneumonia" in nosology, and the circumstances of the well-known outbreak in the East Sheen Boys' School, and other similar recorded outbreaks, give this observation support and established recognition.

In the course of the outbreak the patients at Belvidere were seen by several eminent professional friends at my request. Professor Gairdner was inclined to regard them as cases of "Influenza of a malignant type"; Dr. Finlayson had no doubt that they were examples of what has been called "Epidemic or Infectious Pneumonia." Dr. Samson Gemmell had the advantage of seeing all the cases, having accompanied me repeatedly in my visits to the School as well as to the Hospital, and seen the cases at all stages, within an hour or two of seizure as well as subsequently. I have therefore asked him to give me in writing his general impression, which he has done in the following short memorandum:—

NOTE ON THE CLINICAL ASPECT OF THE DISEASE. BY PROF. GEMMELL, ANDERSON'S COLLEGE.

"It seems to me evident that in the recent epidemic in St. Mary's School we had to deal with a disease allied to the acute specific fevers. The sudden onset with headache, sickness, shivering, and other signs of profound constitutional implication point decidedly in this direction. Moreover, the speedy issue in the four fatal cases (three of them dying after a few hours' illness), finds its closest analogue in the so-called malignant forms of epidemic disease, which terminate in some instances so rapidly that they would baffle diagnosis were it not for clear association with cases having more ordinary manifestations. The two *post-mortem* examinations revealed no specific lesions, but the extremely fluid character of the blood in one case, and the general tendency to enlargement of the spleen and mesenteric and intestinal glands in both, are quite in keeping with the idea of acute specific poisoning, although the microscopic examination of the blood and organs revealed no micro-organisms.

"In view of the frequent occurrence of inflammation of the lungs among the patients, the question of the disease being 'infectious,' or 'epidemic' pneumonia early suggested itself. This is a disease apt to arise under insanitary circumstances, such as overcrowding, deficient ventilation, and other hygienic errors apt to induce infectious diseases in general. And no doubt in this School the sanitary conditions, especially with regard to air-space, as indicated both by the Government Inspector and Dr. Russell, are defective; and pneumonia, not, however, as an epidemic, has been a frequent visitant in recent years. But it must be borne in mind that out of the 66 cases comprised in the epidemic only 17 had decided pneumonia. Other 8 were doubtful cases (some of them very doubtful, the temperature being the only suggestive fact), but the majority of the patients presented no traces of pneumonia at all. No doubt in many of these the disease was of short duration and unattended by high fever, but the general symptoms otherwise were such as to reveal clearly a close aetiological affinity, if not absolute identity, with the more severe cases. They seemed all the victims of the same poison, although in some, owing probably to personal idiosyncrasy aided by favourable atmospheric conditions, it issued in pneumonia.

It is to be remarked also that the clinical features of the pneumonic cases do not strengthen the idea of the disease being 'Epidemic' pneumonia arising from insanitary surroundings. There was no prodromal stage; the local lesion revealed itself early; the disease was unassociated with typhoid phenomena; terminated in crisis, in every instance, within a week; the convalescence being rapid, and the restoration of the lung speedy and complete. In no instance did death occur. Such are not the characters of the infective type of pneumonia; and, indeed, apart from their epidemic association, any of the cases might have been selected as exhibiting most of the typical characters of acute pneumonia as it occurs sporadically.

"It is impossible with our present light to dogmatise regarding the exact nature or genesis of the disease. The question as to whether it might not be an anomalous manifestation of enteric or typhus fever was suggested, but nothing transpired to encourage such an idea. The circumstances pointed clearly, of course, to a local origin of the disease, and it is no matter for wonder that it told with such severity among boys of low constitutional vigour living under unwholesome circumstances."

What ought to be done?—The important question which is the natural outcome of the melancholy history of the St. Mary's Schools is this:—What ought to be done to improve their sanitary condition?

(*a*) *Removal of the Institutions to the Suburbs.*—This is the only radical cure. This step has been from the time of their establishment on their present site urged by the Government Inspector, but they remain. The reason is that referred to in his Report for 1863—"They have to contend with the usual difficulty of institutions of this kind for Catholic children in England and Scotland, viz., very scanty pecuniary resources." (p. 69.)

(*b*) It is surely obvious, nevertheless, that something must be done. (1) The only control which Government can exercise is by *reducing the number of inmates for which they are licensed.* Some sacrifice must be made. The children suffer from air-hunger. If they cannot be transferred to the country, then an endeavour must be made to reduce their number, and thereby raise the proportion of such air-space as the site affords. At present they are exactly in the position of the inmates of an overcrowded house, in which, while there is every condition which induces disease, there is no possibility of separating the diseased from the healthy when in life, or even the dead from the living.

(2) Such a high death-rate necessarily means an equally high sick-rate. Yet there is practically no accommodation for the sick in the Boys' School, and inadequate accommodation in the Girls' School. The number of inmates should be so reduced that space for *a large hospital ward* may be obtained. Skilled attendance ought to be provided by night and by day for those under treatment there, so that such a thing as a child dying unseen should be impossible; not to speak of the inevitable inference that if children die unseen those who survive must be neglected. In the light of medical opinion now-a-days as to the communicability of Phthisis, the prevalence and fatality of this disease in those Schools, taken along with the want of commodious apartments for their treatment, raises the gravest suspicion that Phthisis is not only induced by the prevailing air-hunger, but is propagated by infection. Care is prescribed as to the disposal of Phthisical expectoration by medical attendants in their private practice, and wherever it is possible isolation in bed and living arrangements is thought to be an ordinary precaution.

(3) A *Mortuary* outside the main building, away from the sleeping and living apartments, must also be provided. It is bad enough that in the small houses of Glasgow the dead should be laid out beside the living; but it is intolerable that in a public Institution corpses should be stored away in drug-stores and bedrooms.

(4) A *Probationary Ward* is also wanted in both schools. Children when admitted may bring with them the seeds of infectious disease, and should be kept apart for three weeks under observation.

(5) The boys require a *Play-room* for winter and wet weather. Anything more unnatural and unwholesome than the present practice of penning those children up on such occasions in the school-room can scarcely be imagined.

(6) Hot water ought to be introduced to the taps in boys' lavatory, and heating pipes, so as to have the place warmed in winter before the children leave their warm dormitories to wash.

(7) Every child, both male and female, ought to have flannel underclothing during winter and spring. At present

only the delicate ones are said to have flannels, but all are delicate. When they become so specially delicate as to attract attention it is too late to begin to clothe them warmly.

(8) Another step, which it is within the power of the Local Authority to take, and which ought to be taken at once, is *absolutely to close St. Mary's Cemetery*, and to make arrangements for putting the ground in decent order. It is now, as in 1875, "in a state of rank disorder," and is used occasionally as an exercise ground for the children!

SIMILAR OUTBREAKS IN SIMILAR INSTITUTIONS.

The allusions to the extraordinary occurrence at St. Mary's, published in the Medical Journals, brought me two very interesting communications of apparently similar outbreaks in similar Institutions, and my attention was also called to another published account, all which I append.

1. *Roman Catholic Reformatory for Boys, Westhorn, Glasgow.*

While the St. Mary's disease was in progress, Dr. Scott, of Tollcross, examined the patients at Belvidere, and addressed a letter, under date 16th March, to Dr. Gairdner, who had also seen those cases, and was inclined to regard their disease as "Influenza" of a malignant type. I am permitted to publish the following extracts:—

"I have been Medical Officer of Health to the Roman Catholic Reformatory for Boys at Westhorn for the last twelve years, and have been much interested in the outbreak of this so-called 'fever' in Abercromby Street. I called at Belvidere to-day, and in Dr. Allan's presence I carefully examined several of the older patients, and have come to the conclusion that they are suffering from a form of disease which is exactly analogous to one with which I have had to deal among our own boys.

"About ten years ago, at this very season of the year, when the weather was intensely cold, 10 or 11 of the boys were brought into the Hospital with what I thought at the moment incipient symptoms of typhoid fever. The history of that attack was something like this:—On this cold morning the boys rose and breakfasted in their usual good health. After having been sent out to their work in their various divisions, one after another was noticed to be suffering from cold, and was sent in by their respective masters to the sick-room. Within three hours thereafter these boys gradually assumed a semi-comatose condition, and one of them especially became affected with a low muttering delirium during the time I was even making an examination of his fellows. They complained of no pain, wanted to be left alone, and their temperatures ranged from 104 deg. to 105 deg. Only one had diarrhœa, and he succumbed in 9 hours from the onset of the disease. The boy to whom I have already referred as unconscious died within a few hours. With the others the temperature remained at pretty nearly 105 deg. (its highest stage) for three or four days, during which time there was no appearance of diarrhœa, spots, rush or spit, except in one case in which there was a little pulmonary congestion. At the end of that time the temperature fell to nearly its normal condition, and the boys in two or three days thereafter regained perfect health.

" Since then another epidemic took place about two years ago, in which all affected made a good recovery. On several occasions we have had sporadic cases. One terminated fatally after four hours' illness. In every case the onset of the disease could be traced to—*not a rigor*—but a chill which was long continuous and depressing. During intensely cold weather these boys have to be watched with extreme care. Many of them are constitutionally unhealthy, and from the state of their health and condition of their blood, they seem to be quite unable to stand severe cold. Since our first serious outbreak we are specially careful that the delicate boys are clad with flannel and are not suddenly exposed to extreme cold. Our treatment with regard to these has been warm baths, warm diluent drinks, and some stimulant, and experience has shown that if the capillary circulation of the skin be not restored within the first 3 or 4 days of the onset of the attack, the patient dies of apparent blood poisoning.

" In my opinion the disease is caused by defective capillary circulation and consequent hyperæmia of lungs, liver, spleen, and intestines. I am not satisfied that the disease is infectious, nor can I consider it as pyogenic pneumonia, and I am inclined to think from the cause of the disease and the condition of the patients that it is somewhat like influenza, and that the septic poisoning is auto-innoculative.

. . . .

" The mention of the old graveyard in connection with Abercromby Street School leads to the consideration of the septic influence of Dalbeth graveyard. But why should these germs be most virulent during the coldest part of the year, and be entirely innocent during the hot summer months when our boys are working and playing in its immediate neighbourhood, and that too with large open pits for graves?

. . . .

" Among those affected in our school only one showed symptoms of pneumonia."

. . . .

2. *Birkdale Roman Catholic Reformatory, Southport.*

" 50 Liverpool Road, Birkdale,
" Southport, *March*, 23, 1888.

" Dear Sir,—Excuse delay, but I could not reply earlier to your letter.

" As you suggest, we have had at the Birkdale Reformatory a series of cases evidently of the same kind as those you report upon at the Glasgow Industrial School. Since Jan. 3rd of last year we have had 3 deaths.

" 1. The first case occurred on Jan. 3rd, '87, and I was with the boy for an hour and a half before death. From notes taken at the time I extract the following :—

" I arrived at 10.20 a.m. and found the boy in a state of profound coma, the breathing being slow and stertorous, the pupils dilated and absolutely insensitive to light, flushed face, bounding pulse, 80 ; temp. 101 deg. The chest full of loud, coarse mucous rales, which increased progressively to the time of death. The breathing became slower, the face more flushed, and at 11.45 the boy died asphyxiated, the face finally becoming purple and the heart beating strongly and regularly up to the last. (About 11 o'clock he vomited bile and mucus.) No inquest or post-mortem.

" This boy commenced vomiting in the dormitory about 2 or 3 a.m., having previously been in good health and eating well. A master saw him about 7 a.m., and found him ' languid, with a weak slow pulse.' He said he had no pain, but when he got up he could only walk with the assistance of another boy. At 7.20 he was seen again. He was in the infirmary lying on his bed, and was with some difficulty roused. However, he stood up, and was undressed and put to bed. At 8 a.m. ' he appeared to be in a nice comfortable sleep.'

" 2. *The Second Fatal Case.*—I did not see this boy before death. He took ill in the afternoon with vomiting and heaviness, and at 11 p.m. temp. was 104 deg. About 2 a.m. he was found dying, and was dead when I arrived.

" *Post-mortem.*—Brain and membranes congested. The lateral ventricles nearly full of pink serum ; lungs intensely congested (recent) ; no consolidation ; stomach contained 1½ pints of mucus and bile, as certified by county analyst. Bowels empty ; kidneys healthy.

" 3. *Case 3 died recently.*—I saw him the evening before his death—11 p.m. Temp. 100 deg. ; pulse 96 ; resp. 24. There seemed very little the matter with him beyond a simple feverish attack. At 4 a.m. he vomited mucus and bile, and shortly afterwards was found dead.

"*Post-mortem.*—Brain congested; lateral ventricle on left side half full of pink serum; lungs, stomach, liver, kidneys, congested; right heart gorged; stomach empty; bowels rather constipated.

"I now give a case which I saw recover, and reproduce my notes verbatim:—

"*J.M., 17 years.*—First saw him at 9.15 p.m.; pain in head; perfectly conscious, but dazed; pupils rather dilated; sluggish; pulse 84, strong regular; temp. 101.8 deg.; vomited mucus and bile. Rapidly became less conscious, and at 10 p.m. pulse 100, weaker, irregular; temp. 100.4 deg.

"10.10.—Perfectly unconscious; corneæ insensitive; pulse 92; temp. 100.2 deg.; breathing stertorous. Turpentine enema; 5 grains, and again 4 grains calomel; cloth wrung out of boiling water applied to nape of neck with friction, and then blistering fluid, mustard to calves.

"10.30.—Pulse 72; temp. 99.6 deg.

"11.15—Temp. 100 deg.; becoming more conscious; corneæ sensitive. Made a good recovery.

"4. In addition to these cases we have had, since January, 1887, 23 cases falling ill singly, *i.e.* no two or more boys took ill on the same day, but at varying intervals, such as one, two, three days a week, or two weeks, and in the last case five months. There were two types of this epidemic, viz. the chest type and the head type. The former began as usual with vomiting, headache (not very severe and lasting), and developed a broncho-pneumonia pleurisy or simple bronchitis, which cleared away in two or three days. In the broncho-pneumonic cases immense expectoration of frothy bloody sputa. The head cases were more obstinate and lasted longer. The headache was very severe, and generally was all over the head. One case displayed nothing but a badly-congested throat with yellow mucous patches, and a temp. of 104 deg., which was followed by a peculiarly copious desquamation.

"By careful examination at the hands of experts we have excluded from the possible causes water, drains, food (meat, milk, bread).

"Ventilation is *said* to be good, but I think we are too well ventilated in the dormitories, and too badly in the school-room, which is also used as a play-room. We have about 200 boys, and these boys spend a couple of hours in the school-room before going to bed (in winter). The room then becomes stifling hot, stuffy, and fetid. In sheer despair I have been driven to imagine that this condition of things may amount practically to overcrowding, and that the production of some bacterial poison similar to Typhus may result. We still require a certain and unknown condition of body.

"*Disjointed Facts.*—There is *no* evidence of contagion in these cases. All the deaths have occurred in cold (very cold) weather during a north-east wind. Our series of cases last year finished in August, but earlier on we observed that a warm spell of weather following a cold one put a stop to the series. When the weather became colder they began again. Some slight ones, however, did occur in the warm months.

"I have thus put together in haste such information as, I think, may interest you, but I can, if you wish, furnish you with more or less copious notes of every case we have had. My time is at present very limited, and I trust, therefore, that you will excuse my very imperfect account. I have some reason for thinking that these cases are more common in Reformatory and Industrial Schools than is generally believed. On referring to the Journals of the Birkdale Reformatory, I find an account of a small epidemic (eight cases, with one death) of the same kind about 12 years ago.

"I should be glad of any further communication on the subject.—I am, Dear Sir, faithfully yours,

"(Signed) FRANCIS NEWSHAM,
"M.R.C.S.E., V.C.

"Dr. Russell,
"Medical Officer, Glasgow."

Under date 14th June, in giving permission to publish his letter, Dr. Newsham states that the tobacco theory is also in favour among the Birkdale officials. The vice is general there, but he remarks that "the Clarence Reformatory Ship has never experienced a similar visitation, and I am told that the boys there are undoubtedly more given over to the habit of chewing than the Birkdale boys." He then adds—"One omission of some importance I made in my last letter to you, and that was, that at Birkdale they are not in connection with any system of sewage, but use dry earth system, and collect the liquid refuse in tanks, from which it is pumped on to the farm. The soil, also, after being collected in a heap, at some considerable distance from any of the buildings, is mixed with other materials, and spread upon the land. Now we have not suitable soil for the dry earth system, as the Reformatory was built on pure sand, and the cultivated soil, even now, is in appearance nothing but sand. To remedy this fine ashes are used. But against all inferences under this head, we have the fact that the deaths and worst cases are nearly all among the Shoemakers, and scarcely any cases at all, and no deaths, among the farm lads."

3. *Roman Catholic Poor Boys' School or Orphanage.*

In a paper entitled "Clinical Notes on a Febrile Epidemic Illness at a School," read by Dr. Edward Seaton, 23rd October, 1885, before the Clinical Society of London, and published in volume xix. of the Society's *Transactions*, he gives a careful history of an outbreak of peculiar disease in a "Roman Catholic Poor Boys' School or Orphanage, situate in the country near London." There are 665 inmates, of whom 157 were attacked and 7 died, in June, July, August, and September, 1885. The disease was strictly confined to this school, and did not affect attendants, &c. In five cases there were second attacks after considerable intervals of perfect health. The following is Dr. Seaton's summary of the symptoms :—

"The group of symptoms which characterises this epidemic clinically is as follows :—Suddenness of attack without any premonitory symptoms. Attack commencing with rigors and severe frontal headache, followed in a few hours by pyrexia, vomiting (often severe) without diarrhœa, the acute stage being further marked by scantiness of urine and almost complete absence of chlorides. Rapid development of the crisis, the fatal cases terminating in twenty-four hours, and (in the uncomplicated cases) defervescence commencing in two or three days in the slight cases, and in four or five days in severe cases. The fall of temperature being generally simultaneous with the appearance of a herpetic eruption on the upper lip, and perspiration, but no marked sweating. Earache frequently occurring towards the end of the fever, and sometimes being followed by otorrhœa. Absence of any other local pains except those due to the straining of the muscles in vomiting. The duration of illness generally short and not exceeding four or five days, unless complicated with pneumonia. Surely a disease accompanied by so well-defined a group and train of symptoms requires a distinctive name as much as typhus fever or ague!"

He appends a clinical history of a typical case ending in recovery, which might be that of one of the St. Mary's boys, uncomplicated with pneumonia. He gives another history of a case which proved fatal in twelve hours, which also closely resembles a St. Mary's fatal case. Of the 7 fatal cases, 6 terminated within twenty-four hours. The frequency of rigors, the greater persistency of vomiting, the more general suppression of chlorides in the urine, the association of the herpetic eruption with defervescence more than with the pyrexial stage, and the occurrence of earache and otorrhœa are the only points in which Dr. Seaton's disease deviates somewhat from the St. Mary's.

As to nosology, Dr. Seaton says it "may be called 'synoque' (Devasse), 'ephemeral fever,' or 'herpetic fever,' names which have been used to designate a variety of continued fever, characterised by symptoms similar to those of the disease which in this case assumed an epidemic form." As to causation, it will be observed that this outbreak occurred during summer, not as in St. Mary's, Westhorn, and Birkdale, during cold weather. In the discussion which followed the reading of Dr. Seaton's paper, Dr. Bridges, Medical Inspector of the Local Government Board, attributed the disease to "exhalations from the sewage charged soil," earth-closets being used in the institution, and their contents carelessly distributed over the attached ground. A similar system was in use at Birkdale.

EPIDEMIC NEAR LEICESTER.

In the *Edinburgh Medical Journal* for June, 1886, there is a paper entitled "History of an Epidemic," by W. B. Garvin, L.R.C.P. & S. Ed. It refers to a febrile outbreak in the village of Ansty, near Leicester. The history is very meagre, but it seems to have resembled these outbreaks in many points. There were over 100 cases, chiefly among the young, 2 fatal within 24 hours, the rest recovering in a few days. Dr. Garvin has the same difficulty in naming his disease, but concludes : "It is clear to me that this epidemic was caused by the filth of Ansty. Of filth as the origin I am positively convinced. In the absence of a diagnosis I shall content myself by calling it sewage fever."

(3) *On the Sanitary Requirements of a Dairy Farm.*[1]

1. THE FARM-STEADING AS REGARDS THE HEALTH OF THE INMATES.

A farm-house should, like every other house, be wholesome in structure and furnished with all the usual requisites of health. That this should be so is more vital to the interests of the residents than of any other people ; but the remote consequences of disease in the farmer's household may spread so far through the milk which he produces that their health and the conditions which affect it assume direct importance to every consumer of milk. Therefore, though there may be here and there a farmer who is indifferent to the welfare of his family, he cannot be left alone, because the health of himself and his family, and the health of his distant customers, are bound up together.

---

[1] Drawn up at the request of and issued by the Local Authority of Glasgow for the information of persons engaged in the milk supply of their district, 1888.

A farm-house, including servants' quarters, should be so constructed as to be in all parts dry, well-ventilated, and well-lighted. It ought to have a good water supply, sufficient for man and beast all the year round, brought from some point distant from the area of the steading, from a gathering ground, which is not arable; or, if that is not possible, from such a depth, as to exclude surface drainage. The house-drainage ought to be conveyed below ground through vitrified pipes jointed with cement. There ought always to be at least one privy, and where there are male and female servants, one for each sex, built of stone or brick, placed with regard to decency, and apart from the byres; lime-washed inside and out periodically, and kept scrupulously clean always.

2. THE FARM-STEADING IN RELATION TO THE BUSINESS OF MILK PRODUCTION.

A farm-house may be in all respects wholesome as a residence, and yet be badly planned as regards the business of a dairy farm. All the arrangements of the structure and the habits of life ought to have in view one cardinal principle—the separation, so far as possible, of the domestic life from the milk, in its production, manipulation, storage, and despatch. The reasons of this are two—(1) that milk is prone to contamination from exposure to disease in the persons of those working among it; (2) the risk of contamination by disease is just in proportion to the closeness of the relation between the ordinary domestic life of the farm-house and the structure and arrangements necessary to the business of the dairy. If the bedrooms, the washing-house, the conveniences, &c., are mixed up with the milk-house, the boiler-house, the byres, &c., then whenever disease appears in the family or household mischief is certain to follow. If these various parts of the steading are separated, then the chances are that before the nature of the disease is recognised, no harm will have been done, and after a few precautions will enable the farmer to carry on his business without interruption. The main points to be attended to in the arrangement of structure are these:—

1. A domestic washing-house placed as remote as possible from the milk-house, boiler-house, scullery, and byres is indispensable. No farm-house which is without a separate washing-house can be a safe source of milk supply; yet the almost universal habit is at most to use for boiling clothes a separate boiler beside the boiler used for scalding milk vessels;

and to wash in any convenient place, it may be in some passage opposite the door of the milk-house, or in the scullery. In health this may be only convenient, but the moment infectious disease invades the family the results are disastrous and unavoidable. Explosions of enteric fever and scarlet fever have been traced to the washing day, when the soiled clothing has been brought to the boiler-house, or washed opposite the milk-house door.

2. The milk-house ought always to have its door opening into the free air. It ought to have no other apartment above it, especially no bedrooms. It ought to be well-ventilated, have no internal communication with drains, be entirely free from damp, and so placed that the air which reaches it shall be pure, not near the dung-pit. It will be observed that the usual practice of having the milk-house incorporated with the dwelling-house, opening off the lobby, or kitchen, or scullery, is condemned.

3. The dung-pit ought to be placed as far as possible from the house, especially from the milk-house. It ought not to be a mere hole in the earth, but have retaining walls, an impervious bottom, and over it a light roof, raised on pillars, so as to permit free ventilation and yet keep the rain out, and so preserve the strength of the manure, and avoid the foul drainage which usually streams from a dungstead.

3. THE FARM-STEADING AS REGARDS THE HEALTH OF THE COWS.

It seems unnecessary to expend words in proving the statement that only healthy cows can produce wholesome milk. The health of cows depends upon the same general conditions as the health of human beings—fresh warm air, cleanliness, pure water, proper food. The cowhouse or byre ought to be well lighted and ventilated, evenly paved, not overcrowded, kept clean by regular removal of filth, and by periodic lime-washing of the walls. The influence of warmth on the flow of milk is so great that in the absence of any source of heat but the bodies of the cattle, the temperature is generally maintained by preventing the access of fresh air. This has the same effect on stalled cattle as the same practice in the houses of the poor has upon the inmates—it promotes disease of the lungs, especially consumption. Without artificial heat it is impossible to maintain the temperature of a byre in a normal winter in this country; but this assistance is unknown in our dairy-farms, and hence the truth of the statement recently made by Professor Brown of the Agricultural Department, Privy Council Office, that "nothing worse than the insanitary conditions of the life of the average dairy-cow can be imagined." All that can be said is that in cold weather, without heat from steam or hot-water pipes led through the byre, a comfortable temperature can only be maintained by shutting out the fresh air and storing up the animal heat, and that this is necessarily unwholesome.

4. DISEASES IN MAN IN RELATION TO MILK.

By the Dairies, Cowsheds, and Milkshops' Order it is declared to be unlawful for "any person suffering from a dangerous infectious disorder, or having recently been in contact with a person so suffering" to milk cows or otherwise engage in the business of milk production or distribution. "Contact" ought to be regarded as meaning any sort of communication, direct or indirect, with infectious disease, *e.g.* it would be obviously dangerous for any one who had been in the sick-room, or who had washed an infected washing, to proceed at once to milk cows, &c.

The only safe rule for a farmer to follow is to let no one who is not in perfect health handle his milk. Infectious diseases taper off into slight forms, only recognizable when associated with well-marked cases. Scarlet fever, especially in adults, may produce merely a sore throat, or a blush on the skin which may never be observed. Enteric fever may lurk in what seems to be a simple diarrhœa or "weed." It is not ill-health which has continued for some time, so much as the sudden indisposition which overtakes a previously robust and healthy person, which has to be suspected.

5. DISEASE IN THE COW IN RELATION TO MILK.

By the Dairies, Cowsheds, and Milkshops' Order, the milk of a diseased cow is forbidden to be mixed with other milk, or sold or used for human food, or given to other animals, unless and until it has been boiled. But this enactment refers only to cattle-plague, pleuro-pneumonia, and foot-and-mouth disease. These are acute diseases which soon stop the flow of milk. Tuberculosis is a more insidious disease, which does not do so until it enters on the last stages. Yet the milk is unquestionably unwholesome, and may convey tubercle (the cause of "consumption") to man. Therefore any animal having rapid breathing, a short cough, or emaciation should be examined by a veterinary surgeon; and the milk of no animal showing signs either of local or constitutional disease should be given to man.

A grave suspicion has recently arisen in the minds both of medical men and veterinary surgeons that certain eruptive diseases affecting the teats and udder of the cow are associated with the propagation of scarlet fever among the consumers of the milk. It is not necessary to accept this as more than possible to justify the advice that careful inspection of the cattle as to the existence of any affection of the teats and udder is demanded, and *careful exclusion of the milk of any animal so affected from human consumption is absolutely necessary.* The teats are liable to different kinds of injury or disease. They may in cold weather be chapped or hacked just as the hands of men and women are chapped or hacked by the influence of cold air upon them, especially when wet.

This leads to occasional bleeding in the act of milking, and, although no actual influence on health may follow the use of such milk, it is disagreeable to think of using it. But there are also eruptions, probably of different distinct kinds, of the nature of vesicles or pustules which, through the friction of milking, are broken and give rise to scabs and ulcers. These are well known to be infectious from cow to cow through the milker. Whether or not it be the case that one or other of these eruptive diseases in the cow may produce scarlet fever in man, it certainly is not pleasant to think of the consumption of milk contaminated with blood and matter, and therefore for this reason alone the milk of cows so diseased should not be distributed with the general produce of the dairy. It is a question of sacrificing the milk of one cow or of running the risk of poisoning the milk of a whole dairy.

6. CLEANLINESS IN GENERAL IN RELATION TO MILK.

As a rule nothing could be desired more than is generally practised by the Scotch farmer, or rather by his wife, as regards the careful scalding and cleaning of milk vessels. It is impossible to be too scrupulously careful in this respect. It is unfortunate that in Scotland a barrel is the sort of vessel in use for the conveyance of milk. Wood is porous, and difficult to cleanse in any circumstances, but the structure of the barrel, the inside of which cannot be reached and cannot even be seen, is the worst which could be devised. Only live steam has any chance of making it sweet. Some form of tin vessel, to all the internal surface of which the hand can reach, and which is open to inspection, such as is in common use in England, would be much preferable.[1]

A little advice, also, as to the cleanliness of the udder and teats of the cows, and of the hands of the milkers, is not unnecessary. Attention to the bedding of the cow, and the removal of droppings from the place where the animal lies, will prevent the soiling of the udder.

---

[1] The objection on the score of the effects of sun heat, which, of course, tells more upon metal than upon wood, is not beyond being obviated by a little ingenuity.

If soiled, the teats ought to be washed before milking. As to the hands, no instrument requires such careful washing as the human hand, considering the variety of offices to which it is applied, before it is engaged in the work of the dairy. Every drop of milk may be said to have passed through the hands of a milker, and before milking every milker's hands ought to have been carefully washed. Convenience for the comfortable and efficient use of soap and warm water is an indispensable requisite of every dairy.

Dairy farmers and dealers in milk, however sceptical as to the argument in favour of these precautions on the ground of the likelihood of disease being conveyed by milk, ought not to forget the commercial aspect of failure to be careful and cleanly in every detail of their business. In the first place, if by any chance even suspicion arises in the public mind as to the milk of any farmer or dairyman, his business is for the time ruined. Naturally, the first effort at self-protection is to change the source of milk-supply. But apart from this, the milk which is produced from the healthiest cow, in the cleanest byre, handled by the cleanest milkers, collected in the cleanest vessels, and stored in the cleanest milk house, keeps the longest. In hot weather this means money. A thoughtful customer at once infers, and is right in inferring, that if one man's milk keeps longer than another man's it is to be preferred. It is not merely because of the loss implied by the "turning" of the milk, but because it is some want of cleanliness which causes the "turning."

In conclusion, the attention of farmers is requested to the following extract from a Report to the Veterinary Department of the Privy Council "On Eruptive Diseases of the Teats and Udders of Cows, in Relation to Scarlet Fever in Man," by Professor Brown, from which a sentence has already been quoted. Not being the words of a medical man, but of a distinguished veterinarian, they are free from the suspicion which attaches to merely medical opinion in the eyes of those who are engaged in farming and dairy-keeping:—

"Milk is often collected, both in country and town, with contemptuous disregard of the most elementary sanitary precautions, amidst surroundings which can only be characterised as filthy.

"Dirty premises, diseased and dirty udders and teats, to say nothing of the state of milkers' hands, are stern realities which may be seen by anyone who is curious in such matters, and they must inevitably lead to contamination of milk with septic bacteria, and often with infective matter, not only from consumptive cows, but also from the attendants, who are subject to little or no supervision.

"It is true that in some model dairies a contrast to the above description is exhibited, where absolute and scrupulous cleanliness is insisted on. The health of the attendants is strictly watched, and any temptation to conceal a trifling ailment is counteracted by the arrangement which allows the milkers full pay during absence from illness. The slightest sign of udder disease or other disease in any of the cows is accepted, as it certainly should be, as a sufficient reason for excluding the animal's milk from the common stock. Under such conditions milk may be collected as free as possible from specific or common micro-organisms. This degree of care has not yet been generally taken, nor will be until the authorities interpose and insist that the cleanliness and perfect sanitary arrangements, which are now exhibited in a few dairy establishments, must be the only conditions under which the trade of a dairy man can be permitted to continue."

SUMMARY.

1. A farm-house ought to be wholesome in structure, and the steading well supplied with pure water, drained by vitrified pipes, and with privy accommodation for both sexes.
2. The house ought to stand apart from the premises used for dairy purposes. A distinct domestic washing-house is indispensable. The milk-house ought to open into the free air, and be at a sufficient distance from the dung-pit. The dung-pit ought to have retaining walls, an impervious bottom, and a light roof borne on pillars.
3. The byre ought to be well lighted, ventilated and paved, and regularly cleaned.
4. No person who suffers from infectious, or any recent indefinite illness, or who has been in any way in communication with an infected person or thing, should engage in the milk business.
5. The milk of no animal which seems to be ill, or which has any sore about udder or teats, ought to be sold for human consumption.
6. The udders and teats, if soiled, ought to be washed before milking. Soap, warm water, and towels ought to be at hand, and every milker ought to wash hands before beginning.
7. Healthy cattle, healthy servants, cleanliness in every detail of the business of the dairy farm, mean money to the producer and retailer of the milk.

(4) *Report on certain Cases of Sickness and Death occurring among the Workers of Adelphi Horsehair Factory, Glasgow, in March and April, 1878, with Remarks upon the Communication of Animal Poisons by Means of Horsehair.*[1]

In order to account for the defects which will be apparent in the details of the cases of sickness and death among horsehair-workers, which form the basis of the following report, it is in the first place necessary to give the history of the circumstances under which they were investigated.

On 7th March 1878, I received a letter marked "Private," directing my attention to a report current on the south side of the river Clyde, that several sudden and mysterious deaths had taken place among the workers in the Adelphi Hair Factory (Messrs. John Fraser and Sons), Govan Street, Glasgow.

I at once instructed an inspector of the Department to make inquiries into the facts, and in the afternoon he reported that he had traced three cases of death after short illness, one on 1st March, and two on the 6th, all being females employed in this hair factory. The bodies of two had been already interred. That of the third I saw about 4 p.m. of the same day, and in order to secure a post-mortem examination and full investigation, I reported the death to the police. Next day I also made a personal statement to the Procurator-Fiscal for the county of Lanark. He ordered a post-mortem examination, which was made by Dr. Samuel J. Moore, one of the Medico-legal examiners for the Sheriff of Lanarkshire, on the afternoon of the 8th. The following statement of the symptoms, &c., in those and in other cases of illness subsequently discovered is compiled from notes made by myself at the residences of the parties, and comprises also all the information which could be obtained from every available source, as to circumstances bearing upon the cases.

1. A. M. L., aged 16, hair-spinner, residing at 32 Silverfir Street, came home from her work at the dinner hour (2 p.m.), 26th February, feeling very ill. She was seized just before leaving off. She said, "I am very bad. My head and my heart!" and laid her hand over her stomach. Vomited everything and constantly called for water. Did not sleep during the first night. Bowels moved twice on 26th, and motions were natural. Continued very restless throughout, constantly covered with a cold sweat, and could not be kept in heat. No

---

[1] Appendix No. 7 to Report by Medical Officer of L. G. B. of England for year 1878.

convulsions. Became "Blue like Magenta" before her death on 1st March. Was seen by Dr. Menzies about an hour *after* death. Red blood oozed from the nose and mouth soon after death, but no blood was observed in stools or expectoration during life. No broken skin or local swelling was observed by those who laid out the body. The death was registered as from an "unknown" cause, and the body was interred on the 5th March.

2. M. M'C., aged 32, "yard-woman" in hair factory, residing at 63 Nicholson Street. Usually employed hanging up the hair-ropes in the stove after steaming, but had fed a hair-carding machine for a few days before her dismission on 4th March for misconduct (drinking). Came home at breakfast hour saying she was not to get back to her work. About 5 p.m. went to bed, complaining of "lightness in the head" and pains in her chest and stomach. Had cold sweating that night. Throughout was very cold. Did not vomit but had great thirst and drank water copiously. Was always very restless, so that could scarcely be kept in bed. Skin became blue, and her whole aspect at the close of her life reminded her mother of people she had seen dying of cholera. Her bowels were moved by medicine. Never passed blood by stool or expectorated blood. Had often been observed to cough and spit up black stuff after coming from her work. Died 6th March at 8.30 a.m. Body seen by Dr. Barrie four hours *after* death. Blood began to ooze from nose and mouth very soon after death. The death was registered "sudden, supposed heart disease," and the interment took place on the 7th. No broken skin or local swelling was observed by those who laid out the body.

3. A. N., aged 26, "yard-woman" in hair factory, residing at 46 Rose Street, S. Employed in carrying hair-ropes from the spinning room to the steam-chest in yard. Came home at the breakfast hour on 4th March, saying she was very bad, pained all over, but especially in the head, back, and stomach. Slept well that night, but became very restless next day, vomiting frequently, and being very thirsty. On the morning of the 6th was greatly exhausted, still vomiting, but no diarrhœa, no blood in stools or expectoration. No convulsions or cramps. Was first seen by Dr. Mullan about 15 minutes before death, which took place at 3 p.m. on the 6th March. The body was seen by me at 4 p.m. on the 7th, when blood was oozing from nose and mouth so as to soak a towel and the pillow and bed-clothes. A post-mortem examination was made at 3 p.m. on the 8th, under warrant from the sheriff, by Dr. S. J. Moore and myself. No broken skin or local tumour was discovered. The body was enormously swollen from advanced putrefaction. A report was duly made to the Fiscal by Dr.

Moore, but owing to the state of the body the pathological appearances were entirely destroyed. In our opinion they pointed to some form of blood-poisoning as the cause of death.

Contemporaneously with those three fatal cases of illness there were four girls attacked with symptoms apparently the same in kind, although much milder in degree, and all ending in recovery, viz. :—

1. C. D., aged 24, hair-spinning machinist, residing at 37 Dale Street. Took ill on 1st March with severe pain and "lightness" in the head, also pain in stomach, right side of abdomen, and chest. Felt nausea, but vomited little. Had quite recovered, excepting a sense of weakness, on 9th.

2. M. H., aged 24, hair-spinning machinist, residing at 5 King Street, City. Seized with exactly the same symptoms on 1st March. Was seen by me on the 7th, when she was suffering from debility but recovering.

3. H. C., hair-spinning machinist, residing at 27 New Wynd. Seized at the same date, with the same symptoms. Seen by me on the 7th sitting up, and recovering, but weak.

4. B. R., aged 19, hair-spinning machinist, residing at 42 Thistle Street. Seized on 7th March with the same symptoms. Was seen by me at 4 p.m. on that day, when pulse was 96, and temp. 99 deg. F. Still nauseated. Vomiting throughout more urgent than in other cases. Was able to rise next day, and recovered.

Another contemporary case of illness is worthy of special notice from the presence of a local lesion, which was absent in all the other cases, viz. :—

5. S. F., aged 20, hair-carding machinist, residing at 41 Charles Street, N. On the evening of 1st March returned from work feeling ill, and was unable to turn out next morning. Observed a pimple on outer aspect of left upper arm. Not aware of having pricked herself or being otherwise injured there. On Monday 4th March went to work, but had to return home. On the 5th Dr. Walker saw her. Had headache, and arm was slightly swollen. Seen by me at 6 p.m. on the 7th. Her pulse was 120, the axillary temp. 101 deg. F. The tongue was coated with thin yellowish fur. Complained only of pain in left upper arm, the outer aspect of which was much swollen, the tissues, brawny, and the skin tense and red. At seat of pimple there was seen a *black* spot, as large as a threepenny piece. Arm being poulticed.

On the 8th at 11 a.m. her pulse was 96, and the temp. 99 deg. F. A crop of miliary pustules had appeared over the inflamed area surrounding the black spot, which was larger. Swelling more diffused round her arm, but pain was considerably less. On the 9th, I found the girl up, and dressed, but looking very pale and faint. Her tongue was clean, the constitutional symptoms gone, and the local swelling less and the pain gone. She recovered gradually, the illness leaving great debility behind it.

On 1st April I received intimation of the death of another hand employed in the hair factory, but not in the hair department. The following is the history of the case :—

M. D., aged 20, fur-cutter in Adelphi Horsehair Factory, residing at 3 Saracen Lane. On 29th March was seized with slight shiverings and colicky pains in her bowels. Next day observed a swelling of left cheek. On the 31st this swelling had extended down over neck, and she consulted Dr. Meighan at his surgery, 219 Gallowgate. He has drawn up for me a full report of the case, which, after reciting the facts already given, proceeds :—" Patient said she felt slightly giddy, but had no distinct head-ache. The tongue was dry and furred, and brownish in the centre, the pulse was full and bounding, 90 in the minute. Skin of body generally was dry, but not hot to touch. The face showed a circumscribed flush on each cheek. The swelling covered chiefly the parotid region, extending downwards as far as the clavicle and spine of the scapula, backwards over the side and back part of the neck as far as the vertebral spine, and upwards by a narrow ridge over the zygomatic arch on to the temple and forehead. The swollen part had a firm brawny feel and pitted slightly on pressure. There was but slight redness and no pain or tingling. I noticed also a swelling about the size of a crown piece on the left side of the forehead. Its surface was glossy and had a livid hue, with a reddish elevated spot in the centre, and on inquiry, the patient stated that two or three days before, this had begun as a small pimple which became itchy, and the head of which had been broken off by scratching. She also stated most particularly that the appearance of this pimple had preceded the other symptoms, both local and constitutional. This swelling was firmer and more inflamed than the other swollen parts, and she complained of throbbing pain in it. I cauterized the pimple with acid nitrate of mercury, and prescribed carbolic acid internally. At 8 p.m. I again saw the patient. She was sitting up in bed, very restless and anxious. The swelling had increased considerably, and had now extended to two inches below the clavicle and spine of scapula on the left side, crossing to the right side of the neck in front. Her cheeks were more deeply flushed. The whole of the swollen part had now become of a deep red colour. The lividity on the forehead was also more marked. Patient complained much of thirst; she felt frequently inclined to vomit, and the bowels had been purged two or three times during the evening. She had also colicky pains in the bowels at intervals. Pulse 120, soft, and irregular. Breathing was oppressed and laborious, and she complained of a choking sensation in her chest. There was marked foetor of the breath. I did not see the patient again, as she died at 4 a.m. on next day (1st April). I heard from her friends that she had vomited several times and had frequent desire to empty the bowels. She soon however became very prostrate, and was comatose for some time before death."

Dr. Meighan certified that the death of M. D. was caused by "malignant vesicle."

The case was reported to the Fiscal, and a post-mortem examination of the body was made under a sheriff's warrant on 2nd April in the mortuary of the Central Police Station, 36 hours after death, by Dr. Moore, in presence of Dr. Foulis, lecturer on pathology in the Royal Infirmary Medical School, and myself. The following is an extract from Dr. Moore's offical report :—

"The body was well developed and bore no mark of violence. Rigor-mortis was partially present. A little froth exuded from the mouth and nostrils. A small discoloured patch was observed on the forehead as if produced by nitrate of silver, in the centre of which there was a scab. There were a few very small petechial spots over the sternum and breast. There was a swelling on the left side of the neck, and over the left shoulder. Post-mortem hypostasis well marked over the back. The brown mark on the forehead on being incised appeared to be quite superficial. There was no œdema at the part. On cutting into the swelling on the neck, the tissues were very œdematous, and on incising the part deeply, some cheesy glands were observed. The tissues on the left shoulder and over the upper part of the chest were also very œdematous.

"*Chest.*—The trachea contained some froth, but its lining membrane appeared normal. On removing the sternum the anterior mediastinum was found to be very œdematous. The right chambers of the heart and the large vessels leading thereto were filled with thin fluid blood of a dark red colour. The left chambers were contracted and empty. The lungs were bound to the parietes by old adhesions. At the lower and back parts they were much loaded with thin dark red blood which exuded freely from the cut surface. *Abdomen.*—Some parts of the mesentery, and of the peritoneum were œdematous. The falciform ligament of the liver was very œdematous, and the serous fluid infiltrating it had a turbid, almost milky, appearance. There was a considerable quantity of straw-çoloured serous fluid in the abdominal cavity. The stomach contained some partially digested food and some fluid. A few spots of extravasation were observed in the mucous membrane. The spleen was slightly enlarged and pulpy soft. The liver and kidneys seemed normal. Nothing further worthy of note was observed. The stomach and its contents were placed in a jar, sealed and labelled for further examination if considered necessary. Microscopic examination of some of the fluids was made as the dissection was conducted, and a portion of lung was retained for microscopic examination of the mucus in the air passages."

Dr. Foulis reports the results of his examinations :—" In the vicinity of the glands of the side of neck the cellular tissue was much swollen, and œdematous, and there was decided œdema in the anterior mediastinum down to the diaphragm. The fluid of those parts had a peculiar opalescent appearance, and on microscopic examination crowds of the *Bacillus Anthracis* were observed in a clear colourless fluid. Some of the blood from the œdematous regions of the neck was also examined and found to contain the same bacilli, though in less abundance. The same may be said of the blood from the heart. The red corpuscles did not tend to arrange themselves in rouleaux. The bacillus rods were motionless, of a dimly transparent pale aspect, and of the length of two or more diameters of the red blood corpuscles. The mucus in the air passages contained the usual products of catarrh of the mucous membrane, a very few bacilli, and no dust or portions of hair."

The first question is—what was the nature of the disease which attacked those hair-workers? As I am chiefly concerned with the circumstances under which the disease arose, and its relations to this special trade, I shall state at once, and without discussion of the symptoms, appearances, &c.,[1] that all these

---

[1] To aid in the intelligent consideration of these cases, I give from Hirt (24) and Bollinger (23) the following compendious account of the chief symptoms and post-mortem appearances of *internal* anthrax. The *external* carbuncular form is easily recognised, and therefore need not be described :—

"Malignant anthrax œdema is distinguished from malignant postule in this, that the vesicle and primary pustule are absent. There is no essential difference in their future course. The œdema, a pale yellow swelling, is observed at first only on the eyelids, but spreads later to other parts of the body. The intestinal mycosis arises from internal infection. Its symptoms have been carefully investigated only recently. The initial stage of this affection is scarcely to be distinguished from that of other acute diseases. Depression, faintness, headache, giddiness, and gastric disturbance ensue, and a painless, sometimes bloody diarrhœa sets in with increasing force, leading very frequently to speedy collapse. The patient is often tormented with violent headache, and colicky pains in the abdomen; the respiration is painful and frequent, the pulse quick, and sometimes there are epileptiform convulsions, opisthotonus, and dilatation of the pupils. Local lesions on the skin in the form of small carbuncles, and upon the mucous membrane in the form of hæmorrhagic effusions may frequently be found. A fatal termination has ensued in almost all hitherto observed cases, generally between the first and seventh day after the outset of the illness" (Hirt, p. 104).

The post-mortem appearances in internal anthrax are thus summarised by Bollinger:—"In the abdominal cavity there is generally a moderate serous or sero-hæmorrhagic effusion, and sub-peritoneal suggillations in moderate amount;

cases were in my opinion but various forms of the disease known as Anthrax, Charbon, Milzbrand, Splenic Fever, Malignant Pustule, &c., &c., which is primarily an affection of horses, horned cattle, and sheep, but which may be propagated among all warm-blooded animals, including man. The contagium is demonstrated to be the *Bacillus Anthracis*, a fungoid organism which infects the blood and tissues, which in its full development assumes a rod-like form and is very perishable, but which propagates by spores which are very tenacious of life, and in fact are, when dried, practically imperishable. These organisms were actually observed in the blood of M. D., when examined microscopically. From the general and local symptoms, we have seen that Dr. Meighan certified her death to be from "malignant vesicle." I may also add that Dr. Hector C. Cameron, surgeon to the Royal Infirmary, had no hesitation in agreeing with me that the girl S. F. had "malignant pustule," the whole aspect of the case reminding him of a patient, a hair-worker in the same factory, who died in 1876 from that disease, in whose blood also the bacillus was detected by Dr. Foulis. The particulars of this case will be given subsequently.

The variety in the nature of the disease in these cases has an interesting and important bearing upon their causation, and may, therefore, be more particularly discussed.

Anthrax assumes different aspects, apparently depending on the mode of access obtained by the infecting organism to the system, *i.e.* according as it is inhaled or swallowed, or enters locally by the hair-follicles or other natural or artificial openings in the skin. In the former case it is called charbon fever (*fievre charbonneuse*), intestinal or internal anthrax, and mycosis intestinalis, the symptoms being from the outset constitutional. To this category the cases of A. M. L., M. M'C., and A. N. belong. In the latter case it is known as malignant pustule, charbon, or anthrax proper, the constitutional symptoms being preceded by, or at any rate advancing *pari passu* with certain characteristic local appearances of the nature of a carbuncle or pustule. To this class belongs the case of S. F.

The last fatal case, that of M.D., also belongs to this class, but to the most rapidly fatal form of local infection, or it may be to a combined local and constitutional infection, in which the specific contagium at once passes from its local nidus into

---

the retro-peritoneal and mesenteric connective tissue is infiltrated, jelly-like and of a yellowish and reddish colour" (p. 419).

In all cases the detection of *Bacillus Anthracis* in the extravascular fluids and blood is decisive of the nature of the disease. Rapid decomposition, with its external phenomena—swelling, discolouration, sanguineous exudations from the mouth and nose, etc., are always observed.

the surrounding tissues, and thence permeates the whole body. This has been styled œdematous charbon (*C. Œdemateuse*), malignant œdema (*Œdeme Malin*), or malignant anthrax œdema (*Bösartige Anthrax Œdem*).

The general circumstances under which anthrax manifests itself in man are these : It is always observed in persons employed, either in the care of animals during life, in their slaughter, or in trades and manufactures connected with the utilisation of the various parts of animals. The localities in which outbreaks have been observed in man are therefore either anthrax districts, *i.e.* districts where anthrax is prevalent among animals, or places at a distance where it is unknown as an epizootic, but to which, in the course of commerce, the products of infected animals may be conveyed. As every single item of these products may be a carrier of infection, the ultimate place of manifestation of the disease is as varied and widely distributed from the original focus as the products and their destination. Hair, wool, bristles, hides, horns, hoofs, &c., being valuable articles of commerce and in wide request, those parts of animals have furnished the most startling demonstrations of the vitality and portability of the disease by its propagation to man. Hirt (24) thus enumerates the various classes of workpeople who have suffered :—" Tanners, makers of coarse hats, fellmongers, furriers, fur dyers, workers in horsehair, wool, and paper factories, and ropemakers who clean hair brought from abroad, *e.g.* from Russia " (p. 102). This reference to the special likelihood of Russian hair conveying the infection shows that anthrax may so constantly be present in certain countries as to mark out the spoils of their animals as specially likely to contain and convey the disease. We are told by several writers that there is no country where anthrax is more constantly present and severe in its ravages among horses and horned animals than in Russia, especially in Siberia. In Siberia horses are the chief victims. Naturally cases in man are also very frequent there, resulting in epizootic years in hundreds of deaths. This sufficiently accounts for the circumstance that " Russian hair " is very frequently mentioned in records of outbreaks of anthrax among hairworkers ; and hair is more frequently associated with such outbreaks than any other animal product.

A few references will prove how thoroughly recognised by continental writers were those risks of the hair trade. The first also shows how very early Russian hair gained an unfortunate notoriety in this relation.

Heusinger (8) quotes from the " Memoirs de l'Académie de Med." so far back as 1777 the following passage :—" Malignant carbuncle in Paris as a rule only affects those engaged in two trades, the tallow-chandlers, or those who work with mutton fat, and horsehair workers. The latter are most frequently affected; indeed it is seldom that they pursue this trade long without suffering from it, and many die. They have observed that the hair whose manufacture is most dangerous is that which is imported from Russia. This hair is usually in a bad condition; a part is sometimes transformed into grey dust, and has a disagreeable smell. The case of carbuncle which Paulet saw was that of a young woman who had opened a bale of this hair" (p. 403). In 1822 Patissier published a book (1) based upon Ramazzini's historic treatise "De Morbis Artificium" (Padua 1713), a section of which is entitled "Maladies des Criniers." He there states:—"Workmen who unpack bales of hair and who beat them are liable to contract malignant charbon and boils. The 'Gazette de Santé' (March, 1777) contains the history of some workmen who had been attacked with those diseases after having without sufficient precaution opened and sorted bales of hair imported from Russia" (p. 242). In 1860 Vernois, in his "Traité pratique d'Hygiène industrielle" (12), has an article "Crins (Preparation des), Appret et teinture" from which we learn that this trade was by the French Government in 1843 placed in the third class of dangerous employments as requiring police supervision. Among the "causes d'incommodité" he mentions:—"Dust in the beating and sorting rooms. Sometimes the occurrence of serious mishaps to the workers, through the hair being impregnated with the blood of animals dying of charbon or glanders." In Tardieu's "Dict. d'Hygiène" there is an article, "Criniers," in which those risks are mentioned as common, and certain precautions are recommended. Eulenberg (20) and Hirt (24) have similar references. This is enough to establish the statement that since the earliest systematic treatises on industrial hygiene, the dangers of the manufacture of hair as a medium for the conveyance of animal poisons to man have been recognised and amply discussed by foreign authors.

The fact that anthrax is enzootic in the pastoral districts of all the chief European countries excepting Great Britain, sufficiently accounts for the circumstance that all our precise knowledge of the disease, both in the lower animals and in man, is derived from the observations and investigations of foreign writers. It is, nevertheless, remarkable, considering our commercial relations with those countries, and the existence among us of old-established and extensive hair factories, that so far as I can discover only one casual record has been made of malignant pustule in connexion with an English hair factory.

Indeed in Thackrah's (4) small treatise on trade diseases, published in 1831, the first work in the English language devoted to the systematic treatment of this department of hygiene, we find this passage, which proves that it was not want of knowledge or observation of the hair trade in its health aspect which caused the communication of specific infection to be overlooked :—" Preparers or dressers of hair—men, women, and boys—are in an atmosphere of dust and stench, especially when employed on the foreign article. The winnowers suffer most. The complexion is soon rendered pale, the appetite reduced, the head affected with pain, respiration impeded, cough and expectoration established, the body emaciated. I scarcely need add that life is sacrificed to a continuance of the employ. In most baneful arts and occupations the wages are high, but here we find with surprise that a winnower does not earn more than 4s. 6d. or 5s. a week. For what a pittance is health broken and life destroyed! But why should the winnowing be effected by hand at all? Why not employ machinery to turn the fan? Or why not collect the dust in a box and carry it off through a wooden chimney by the current from the fan? Few persons indeed are employed in the dressing of hair, and fewer are acquainted with their situation and suffering. This may palliate, but cannot excuse the neglect " (p. 69). Therefore " foreign " hair was then imported into England, but was known only as more productive of " dust and stench " than the home article. That specific infection was not observed even more recently becomes the more remarkable when we remember that Dr. William Budd read a paper before the British Medical Association in London in 1862, entitled, " Observations on the Occurrence of Malignant Pustule in England, illustrated by numerous fatal cases " (published in " British Medical Journal " for 1863). At that date he could not refer to a single case in association with a hair factory in this country (evidently not being aware of Mr. Lawrence's cases, which were published in 1847), but he quotes two continental examples. Yet with these suggestive incidents, so widely published, no similar mishap seems to have attracted attention in this country during the intervening 16 years. Additional facts made out in reference to the Glasgow Hair Factory, discovered and interpreted in the reflected light of the events above recorded, make it unfortunately too probable that we cannot infer from the absence of any record of such outbreaks of anthrax among British hair workers that no such outbreaks have occurred. The probability is that they have occurred from time to time, but being chiefly of the intestinal or internal variety, as in the present instance, they have not been recognised.

I have not been able to obtain full details of all the hair outbreaks recorded, but it will be useful to collect such facts as I have alongside of the Glasgow cases, before considering the circumstances special to this trade, which originate and facilitate those accidents, preparatory to suggesting preventive measures.

Rayer (3), states :—" During the three years I was attached to the Hospital St. Antoine, I saw several cases which all came from the same manufactory, in which the business of cleansing and preparing hair, imported from Russia, was carried on " (p. 558). Budd refers to this statement and says that these cases were eight in number, and calls them " malignant pustule," but Willis' translation of the second edition (1835), to which alone, and to the original first edition (which contains no mention of the facts), I have had access, specifies no number.[1] In the translation one hair factory case is detailed. and three casually mentioned, all of date 1829, on the statement of one of those patients. Two are undoubted illustrations of the true external anthrax, the local tumor being on the face and neck in one and on the thigh in the second. All were fatal except this last. Rayer says : " According to the patient, weakness, prostration, and spitting of blood are symptoms of frequent occurrence among the workers in hair. His daughter had died after an illness of five days, with symptoms of this description, and one of his fellow labourers had sunk, some time previously, in two days " (p. 567). This rapidly fatal case is certainly suggestive of the internal form of the disease. Another fatal case of external facial anthrax is detailed, which occurred in a female " carder of mattresses." Proust (19), also refers to the liability of " mattress-workers " to charbon. Budd says, " I think it is the same writer (Rayer), who records the still more remarkable case of three persons who were attacked with the disease after cleaning some hair that had for many years served as the stuffing of an easy chair." I have not been able to verify that reference to Rayer, but such an occurrence is quite within the range of possibility. Given the contagium in a dry condition, and it seems to have no limit to its potential vitality.

There is a valuable special paper on the association of hair manufacture with charbon, by Dr. Ibrelisle (5), published in the " Annales d'Hygiène " (1845) :—" Sur les Accidents qui peuvent resulter de la Manipulation des Crins." It is introduced by the following remarks on the general question by the editors :—" Experience has superabundantly proved that animal matters long accumulated yield a dust which is extremely injurious to persons who breathe it. This is especially true of hair. This material, charged with cutaneous secretions and blood, befouled by fœcal matters which escape at the moment of slaughter or of natural death, is packed in bales to be exported from Brazil, Buenos Ayres, or Russia. It yields a dust from animal debris, fermented and changed in character, which will certainly prove poisonous if inhaled in great quantity. It is not necessary for the explanation of this poisonous property, to assume that the animals have died of contagious diseases" (p. 339).

---

[1] There was a new edition of Rayer published in 1845, to which Budd no doubt refers, but which I have not seen.

The editors of the "Annales d'Hygiène" doubt the specificity of the effects of foul hair; and certainly Dr. Ibrelisle's cases of malignant anthrax are peculiar in this, that they were distinctly associated with other cases of boils or simple furuncle. They occurred among the male prisoners in the prison of Metz, and only among those who were employed in beating, picking, and teazing hair. In May, 1842, four were seized with boils, appearing in numbers on the back, the neck, the arms, and the thighs in each case; preceded by debility and gastric disturbance. These were followed by a fifth case having all the characteristics of "true charbon" on the right neck. In succession there were six similar cases, the anthrax postule being on the neck in four, on the cheek in one, and on the loins in another. Besides these characteristic cases there were five of an intermediate character, the local lesion being on the shoulders, neck, and thigh, and lastly, eleven cases of simple boils like the first four. Dr. Ilbrelisle says that the employment was very dusty, and that the foreign hair produced a risk not only from the dust, but from contagious diseases; but he adds, "I attribute to a common cause the eczematous eruptions which I have observed, from 'le furuncle simple' to 'l'anthrax grave.'"[1] He bears distinct testimony to the fact that these risks were well known to attend all hair manufacture. "Medical men who have studied the diseases of artizans, regard work among hair as very dangerous to those who engage in it." One-third of all the prisoners engaged in this work were attacked, an excessive proportion, which he attributes to the small ill-ventilated cells in which it was carried on.

Trousseau's cases are quoted frequently (7). He states (Gaz. Med., January, 1847) that in two Parisian factories for working up horse-hair from Buenos Ayres, and in which only six or eight hands were employed, 20 persons died in the course of 10 years from malignant pustule. He himself treated three cases from the same factories, successfully by means of severe cauterization.

---

[1] These facts and opinions, especially the facts, are very interesting in view of the theory of the late Dr. Laycock that ordinary carbuncle arises from the imported poison of "epizootic carbuncle." See paper on "Contagious Furunculoid."—*Edinburgh Medical Journal*, June, 1857, Part I.

In the Second Annual Report of the State Board of Health of Massachusetts, U.S.A., for 1871 (19) there is a paper giving a very complete account of 26 cases which occurred between 1853 and 1870 among the workers in a hair factory in the town of Walpole in that State. This paper is all the more valuable to us that it views the subject from a preventive aspect.[1]

The whole history is so analogous to what we shall subsequently see has been the history of the disease in the Glasgow Factory that I must give it in some detail. The first case occurred in 1853. A workman was taken suddenly ill and died in two days, a well marked characteristic vesicle having in the meanwhile appeared. The next case occurred in April, 1861, when "another man expired after an illness of 24 hours, having obscure symptoms of blood-poisoning, but without the appearance of any vesicle. Two months later this was followed by another case, accompanied by a vesicle upon the neck." *These isolated cases attracted little attention at the time.* "In March, 1866, another operative died, manifesting unmistakable symptoms of charbon, and from that time till July, 1869, the disease seems to have lurked about this same factory, indicating its presence at pretty regular intervals. During this period seven or eight cases have occurred each year, the average number of operatives employed being about eighty." The following table shows the total number of cases up to November, 1870, their nature and results :—

	Cases.	Died.
Malignant vesicle - - - -	15	5
Internal lesions - - - -	10	8
Malignant Œdema - - -	1	1
Total - - - -	26	14

In the 15 cases of malignant vesicle the external lesion was situated in six cases on the neck, in five on the face, in one each upon the shoulder, nose, scalp, and arm. Of the eight fatal cases of internal anthrax five succumbed within 24 hours of the attack. Of the 26 cases, 24 were employed in manufacturing curled hair. Of the other two, "one was *a carpenter, who a short time previous to his attack had worked about the buildings connected with the factory*, and the other was seized shortly after having nursed her husband who had been ill with the same malady." As to the source of the hair which introduced the poison we are informed that it was "sheared from the necks and tails of living wild horses, and is imported in bales for the most part from Buenos Ayres, *a small portion only being brought from Europe.*" This latter statement suggests the question whether the "small portion" was of Russian origin, but no further information is given. The process of manufacture was much the same as that pursued in the Glasgow Factory (of which an account will subsequently be given). "During all these processes the hands of the operatives are brought constantly in contact with the hair, while in the vicinity of the picking machine the air is loaded with minute particles of dried animal matter, so that there is every facility for absorbing the poison by both contact and inhalation." It is noted that some specimens of the hair were quite clean, while others were "often matted together with dirt and putrid animal matter." Repeated inoculation experiments were made upon rabbits with this animal matter, but "without producing any characteristic effects."[1] In other American towns there are larger factories than that in Walpole, supplied with hair from the same sources, and "the most careful inquiry has failed to discover a single instance of the disease, or anything resembling it in any other factory." The importers asserted that no similar accident had ever come to their knowledge. The bacillus anthracis was discovered by Drs. Stone (16) and Hodges (17) in two of the cases, one of external pustule, which, though very severe, ended in recovery, and one of the internal variety, which ended fatally.

---

[1] See also Dr. Stone's paper (16) for fuller medical details.

In Mr. South's additional notes and observations, in his translation of Chelius's "System of Surgery," (6) published in 1847, I find the only record of cases of malignant pustule arising in an English hair factory. Three cases were communicated by Mr. Lawrence, who says, "In the other instances, both of which were persons employed in a horse-hair manufactory, the skin had sloughed before they came to the hospital. The affected portions were circular, the size of a shilling in one, on the front of the chest, that of a sixpence in the other, on the forearm. There were no other local symptoms nor the slightest constitutional disturbance." (Vol. I., p. 69.)

In a paper by Wagner (22) "Die intestinal Mycose und ihre Beziehung zum Milzbrand," there is a history of a series of cases observed in Leipzig with ample details of symptoms, pathological appearances, and microscopic examinations of the tissues and fluids. We shall confine ourselves to the facts bearing upon their ætiology. (1) A dyer of sable furs died in hospital two hours after admission, 25th November, 1872, his illness lasting about 24 hours, ending in epileptic convulsions, opisthotonos, and coma. (2) A hair rope spinner, aged 23, who had been engaged in the manufacture of Russian horsehair, walked into hospital 31st March, 1873, complaining of diarrhœa, cramps confined to his left side, and colicky pains, his illness having begun 24 hours previously. He went to bed, and died almost immediately. (3) A clerk, aged 30, entered hospital 26th June, 1873, and died in 12 hours. Awoke feeling ill on 21st but worked till 24th. He was employed in the goods department of a railway. (4) A message-boy, aged 16, employed in a factory where Russian horse-hair was in hands; observed a vesicle at left angle of lower jaw on 30th August, and entered the hospital on 1st September collapsed and cyanotic. He died on the 3rd. These cases furnish the basis of the paper, but the following are collected and added:—(5) A hair rope spinner, aged 18, employed in the same work as (1) who had been carding Russian horse-hair which was intermixed with ox-hair, died a week after observing a vesicle under his chin, 20th February, 1870. (6) This case led to the discovery that "a workman in the same work had two months previously become suddenly ill, and died quite unexpectedly. A homeopathic practitioner regarded the case as pneumonia, although he thought it obscure, and could not account for the death." (p. 29.) (7) A hair rope spinner, aged 21, died 6th July, 1857, with symptoms of peritonitis after an obscure illness of about a week. (8) A bristle binder, aged 60, died 27th March, 1875, after a rapid illness of 24 hours, in which headache and vomiting were prominent symptoms. In cases 1, 2, 3, 4, 5, and 8, the *bacillus anthracis* was found in abundance, especially in the extravascular fluids, but also in the blood occasionally. Cases 6 and 7 are associated by Wagner with the others in the light of their ascertained nature, as being the same disease, but not recognised at the time. He also gives references to similar cases, not however in hair-workers, and quotes Neyding of Moscow, as saying that malignant pustule was observed by him most frequently in workers in hair and bristle factories. Münch also had examined in Moscow, within four years, no fewer than 28 bodies of persons who had died of this disease. In 15 there was external carbuncle, in two it was very small and insignificant, and in 11 there was no external lesion whatever. These cases mostly originated in works where horse-hair and similar products were manufactured.

---

[1] Virchow (10) made similar experiments on dogs and guinea-pigs with the same unsuccessful results (p. 387).

Wagner adds that such cases were unknown in Leipzig, in works where Russian or Siberian horse-hair was not manufactured, and that workpeople employed in the same work which supplied the fatal cases of internal anthrax had been treated for external anthrax in the surgical department of the hospital. He states that this hair was extremely dirty, and thinks that the bacteria get access to the stomach with food, especially with breakfast and afternoon refreshments, which are taken during work in the workroom, the viands being powdered with infected dust, or contaminated by the unwashed hands of the workers.

We see, therefore, that in Great Britain, France, Germany, and America, Russian hair has proved itself to be *par excellence* a dangerous material—the most dangerous hair in use; while not unnaturally in Russia itself the occurrence of anthrax infection in hair factories may be said to be frequent and deadly.

The Adelphi Hair Factory buildings are very extensive, as may be seen from the accompanying plan and this bird's-eye view.[1] The particular part of the trade allotted to each building is marked upon the plan, so that it can be readily made out where the processes to be described are carried on. It is not my intention to describe all the processes of all parts of the manufacture of the different sorts of hair, but principally to give an idea of those applied to the hair in question. The hair is received in bales, and is treated differently according to quality and destination. Some is first of all passed bit by bit through the hands of women, who with considerable nicety of touch teaze out and assort the various colours and qualities, removing in the process the grosser impurities. This is mostly done in the basement flats on the extreme left, and at the end of the enclosure opposite the main entrance. Some hair, such as that which caused this outbreak, is not sorted but is first unpacked from the bale to be subjected to the process of "willowing," in machines which by violent rotation and disturbance remove all dust and animal debris. It next passes on to the "carding machines," which remove all the finer dust, and improve the gloss and elasticity of the material. These machines are ranged in a long shed open to the roof, and are constantly surrounded with an atmosphere of dust. Their whole work is effected by rapid movement and disturbance of a parched unadhesive material, charged with dry debris, which it immediately sends off in the form of dust. It is not, therefore, in the nature of things possible that the work of feeding and tending these machines can be prosecuted without filling the lungs, and powdering the exposed skin and garments of the workers with this dust. The hair is now ready for the spinning and curling machines. For this purpose it is conveyed up a broad open stair, from one end of the machine-shed to the second flat of the building on the extreme right, which is open from end to end, and from side to side, and is lofty, airy, and well-lighted and ventilated with numerous windows. The operation of spinning closely resembles that of ordinary rope making. The girls carry the loose hair in bags tied round their waist, retreating backwards, applying successive portions of hair therefrom to the revolving rope, so that any remanent dust or microscopic particles are thrown up just about the breathing level. The tightly twisted and coiled ropes are now carried down the stair *through the carding shed* to large steam chests in the yard, standing in the open air at the foot of the chimney stalk on the left, where they are boiled and steamed for 20 or 30 minutes. On being removed from these vats the ropes are hung up in stoveing chambers on the basement flat of the building on the extreme left to be dried. The object of this is to " set the curl " and give the necessary elasticity to the manufactured article.

---

[1] Not reproduced here, but included with original report which forms Appendix No. 7 to Medical Officer's Supplement to Eighth Annual Report of Local Government Board (England).

The special hair which was in hand at the time of the recent outbreak of anthrax is known as " Raw Russian manes," and being required of its natural mixed colour in the manufactured state was not assorted, but passed at once into the " willowing " and " carding " machines. The " Russian manes " were on this occasion put in hand on 16th February and withdrawn upon 2nd March, when the news of the death of M. L. on 1st March came to the ears of the proprietors. The relation of the illness of the workers attacked to these dates, and the nature of their employment, &c., will be seen at a glance from the following tabular statement :—

Name of Worker.	Nature of Work.	Date of		Duration of Illness.	Form of Disease.
		Sickening.	Death.		
A. M. L.	Hair spinner	26th Feb. 2 p.m.	1st March	3 days	Internal A.
M. McC.	Yard woman	4th March 5 p.m.	6th do. 8.30 a.m.	39½ hours	Do.
A. N.	Do.	4th do. 9 a.m.	6th do. 3 p.m.	54 hours	Do.
S. F.	Hair carding	1st do.	-	Recovered	External A.
C. D.	Hair spinner	1st do.	-	Do.	Internal A.
M. H.	Do.	1st do.	-	Do.	Do.
H. C.	Do.	1st do.	-	Do.	Do.
B. R.	Do.	7th do.	-	Do.	Do.
M. D.	Fur Cutter	29th do.	1st April, 4 a.m.	3 days	Mal. Œdema.

The " yard women " were employed in the steaming of the hair ropes. A. N. took the ropes from the spinning flat and put them in the steam chest, necessarily passing through the carding flat in the transit. M. M'C. hung up the ropes in the drying stove after boiling; but it will be remembered that for three or four days before her dismission, she had fed one of the carding-machines. With these explanations a consideration of the nine cases of sickness yields the following results : Five cases sickened within the " Russian manes " period; two in two days thereafter, one in six days, and one in 27 days thereafter. Classified as to their departments, five were engaged in hair spinning, and one went into the hair spinning flat to remove the ropes; two were engaged in hair carding or "willowing," and one was employed in a distinct department of the business, fur-cutting, *i.e.* tending a machine which shaved the fur off rabbit skins for the felt hat trade. As to the form of disease, there were seven cases of internal anthrax, of whom six were hair-spinners and one removed the ropes from the spinning flat; and two cases of external anthrax, of whom one was a carder, the other a fur-cutter.

Now, assuming the Russian "manes" to have been the source of the contagion, there are two facts which demand explanation: (1) The sickening of four of these workers after this hair had been withdrawn from manufacture. (2) The seizure of the girl M. D. not merely 27 days after this withdrawal, but although she was employed in an entirely different department, and was not necessarily in direct contact with the hair at all. The questions involved in the former case refer to time, in the latter to place and time. What is the incubation period of anthrax and what are the laws which govern its diffusion? Nor are these questions distinct, *i.e.* there may be something in the physical condition and laws of diffusion of the contagium which makes the difficult question of incubation of comparatively little practical importance in certain circumstances. Such circumstances attended the Glasgow outbreak. The incubation period is said by Raimbert to be one to three days; by Bollinger to be sometimes very short, but usually to be three or four or at most five days, and by Virchow to be most usually a few days rarely longer than 11 to 12, but frequently only a few hours, or it may be entirely absent. We might, therefore, bring the actual date of infection of all those cases save one within the "Russian manes" period, since they sickened from two to five days from its cessation; but the exception goes quite beyond such a theory, viz., the fur-cutter who tended a machine for shaving the fur from rabbit skins. She stood when so employed at the corner in the basement flat marked with a x in the plan, immediately opposite a window, in the middle of which was a ventilating pane of glass. Both hares and rabbits have been known to contract charbon in districts where it prevails among cattle, apparently from feeding on the same pastures. Indeed, at the very time of this occurrence in Glasgow, there was an outbreak of this disease among cows at Dalkeith near Edinburgh, and I learn from Principal Williams of the New Veterinary College, Edinburgh, that hares were frequently found dead in the locality, and were ascertained to have died of charbon. Raimbert (14) states that rabbit skins have been known to communicate the infection to man (p. 146). In the present case any such effect would in all probability have manifested itself at a previous stage of the manufacture, viz., in the process of combing and cleaning to which the skins were subjected before reaching the fur-cutting departments; but I believe that it was not contagion proceeding from the fur, but from the " Russian manes " which originated the disease in M. D., as in the cases of the girls actually in contact with the hair.

This brings us to the general circumstances of the outbreak in relation to the well known characteristics of the contagium of this disease. Here, as in reference to the matter of diagnosis as based on the symptoms and pathological appearances, I shall not enter into a minute discussion of this contagium. It is so easily recognised and isolated that the *bacillus anthracis* has been the subject of most precise observation and experiment which have not only yielded a minute acquaintance with its own habits, but have thrown a flood of side light upon the phenomena of infection in general. Combining the results of those laboratory experiments with the observations so abundantly made as to the etiology of charbon, as seen in veterinary practice as well as in man, it has been ascertained that in the dry state, the contagium has scarcely any natural limit to its vitality, and is invulnerable by any artificial dry application or process. Moisture and the supervention of decomposition in the medium where it resides seem to bring the only natural termination to its organised existence, and infecting powers. Once let the medium in which the resting spores of the bacillus exist be dried, while yet fresh, whether that medium be some part of the animal, as bones, hides, horns, blood, &c., or some external fomites, as excrement, hay, straw, rags, hair, wool, which do not contain the poison in their structure, but include it in their bulk, and those substances become a perennial source of infection in fitting circumstances. Bollinger (23) states, " the customary medium of communication for anthrax poison is the air, whether the carriers of that poison (*anthrax bacteria*) come out of the soil or are derived from living animals. The digestive track holds the second place " (p. 384). " Small and light they [the spores] are wafted by the breeze and either directly breathed in by the animal, or they fall upon the fluid or solid food, and with it enter the body " (p. 393).

If now reference is made to the description of the manufacture in the course of which those cases of anthrax arose among the workers, this is what we find. Those " Russian manes " more or less are derived from infected animals, they are more or less loaded with dried fomites, excrement, fresh desiccated blood, &c. The whole object and result of the various processes of " willowing," carding, and spinning is violently to disturb, dislodge, and dispel in the shape of dust those infected matters. The result was to create an infected atmosphere which not only pervaded the machine room and the spinning flat, but at the time of this accident must have extended outside, as the arrangements were devised so as to throw the greater part of the debris into the open air through shafts connected with the machines, and discharging on the roof of the machine shed. Hence, as seen from the window of the spinning-flat, there was a constant stream of dust pouring out of the ventilators and the roof of the shed, and even the vacant ground intervening between the two buildings was powdered thickly with this dust, and seeds of various kinds were here and there germinating. There can be no doubt that the more deadly seeds of anthrax were present in this debris, and from their lightness more plentifully suspended in and conveyed by the currents of air. We may, therefore, conceive the poison as not only in the general atmosphere of the yard, but as settling down in quantity on convenient surfaces in corners here and there, ready by a chance puff of wind to be blown again into dust, and so inhaled or deposited upon the skin or about the dress of any unfortunate worker in any department of the work who chanced to be near.[1] Once admit those physical conditions to be correctly described, and everyone of the cases is brought within the scope of their action. All the workers attacked were either engaged directly in the dust-producing processes, or indirectly brought within the sphere of their influence. The case of the fur-cutter is precisely analogous to that of the carpenter in the Walpole outbreak. "A short time previous to his attack he had worked about the buildings connected with the factory." Among Wagner's cases also we find a "message-boy" employed in a hair factory. Why these persons were infected and the many who had casually been exposed had not been infected is a question easily to be solved in perfect consistence with the general phenomena of all infection, which work themselves out in the presence of such controlling circumstances as the physical facts of the case create. The material germs of disease are unequally distributed in the medium which contains and conveys them, and the actual infection follows or not upon the sufficient or insufficient insemination of the individual exposed.

The type of disease communicated corresponds with the conditions under which the infection occurred. Of the nine Glasgow cases, seven were examples of internal anthrax. Of the 26 American cases 10 were internal. Wagner's cases are all internal. In Russian factories the majority are of this type. Hirt tells us :—"The fact has recently been established that internal infection may occur either through the inhalation of anthrax bacteria with the air, or by their introduction with food. The disease developed in consequence of this infection is identical with Milzbrand, and has been observed and described under the name of Mycosis Intestinalis by Waldeyer in a slaughter-house forage-master; by Neyding and Münch in workers in bristle factories; by E. Wagner in a fur dyer, three ropemakers, and a bristle binder" (p. 103). In all these occupations the material is dry and dusty and the process tends to infect the air, but in none on such a large scale or so necessarily and inevitably as in the manufacture of hair. In it the nature of the trade processes co-operates with the characteristics of the contagium to produce the most favourable circumstances possible for internal infection.

---

[1] It is worth noting that the month of March, 1878, was unusually warm and dry. There were only 11 days on which rain fell, and the total amount was but 1·6 inches. The fur-cutter sickened on the 29th, and during the previous 17 days there had been only on two occasions a trifling shower.

This tendency to internal infection in hair works has an important relation to the fact that so little has hitherto been observed of such occurrences in this country. I have already expressed the belief that this does not prove that the experiences of the continent are exceptional, but rather that here they have passed unnoticed. "In intestinal anthrax, which is much more rare, it is difficult to make a diagnosis from the symptoms and appearances alone. In consideration, however, of the rapid onset of the disease, its acute course, and violent manifestations (diarrhœa, vomiting, cyanosis, convulsions, collapse), and the business of the patient, an accurate diagnosis is possible." (Bollinger, p. 424.)

The proprietors of the Adelphi Hair Factory stated that in an experience of over 40 years, during which Russian hair had been largely manufactured, no such outbreak had occurred, or any mishap to direct their attention to the risks so generally recognised on the continent, though utterly unknown to them. But the narrative of the present outbreak makes it abundantly clear how readily even it might have escaped notice, not to speak of sporadic cases at long intervals such as preceded a similar alarming succession of cases in the Walpole Factory. The death of A. M. L. was registered as from an "unknown" cause; that of M. M'C. as "sudden, supposed heart disease"; that of A. N. as "unknown." Yet now that the facts are before us there can be no doubt whatever, that all three died from internal anthrax. There is therefore ground for suspicion that fatal cases may from time to time have been recorded on similar erroneous or imperfect information. This suspicion assumes the form of a certainty or a strong probability in reference to three deaths of workers in this same factory which took place in 1876-7. My attention was directed to them and other deaths in connexion with another factory, by the statements of the workers in Adelphi Factory as to such events, the recollection of which was naturally revived at this time. There could be no doubt that in their minds at any rate "Russian hair" was associated with anticipated risks. The first case to which I shall allude was one of malignant pustule admitted under the care of Dr. Hector C. Cameron, into the wards of the Glasgow Royal Infirmary, on 10th October, 1876. The following history is compiled from copious notes made by Dr. Cameron at the time, and kindly communicated to me. I have not dwelt much on the local appearances, which are minutely described, as there could be no question of the diagnosis, which was confirmed by the detection of the bacillus anthracis in the blood.

C. H., aged 19, residing at 237 South Wellington Street, hair spinner. A pimple appeared on 6th October, 1876, on left angle of lower lip. It was black in the centre with a yellow ring outside the black, like a "shilf-corn" or a flea-bite. She made no complaint until 8 p.m. on the 7th, having gone to work that day. She then felt "out of sorts," and took some laxative medicine. The lip swelled up in the words of her mother, "as fast as a loaf in an oven." She was out of bed on the 8th, but on the 9th, felt very weak and was very restless. On the 10th, about mid-day, she entered the hospital, pulse 120, and the local appearances entirely typical of malignant pustule. Passed a very restless night, constantly endeavouring to get out of bed. On the 11th, her pulse was 140, temp. 104.4 deg. F., her respirations rapid and laboured; much moaning and restlessness. A plentiful crop of small vesicles and pustules had appeared over trunk and limbs, interspersed with numerous minute hæmorrhagic spots, permanent on pressure. On the 12th the patient was evidently sinking, pulse 140, respirations 50 per minute, and temp. 103 deg. F., in morning; passed everything in bed. The minute vesicles were more numerous. Died at 9.3 p.m., the temp. being 106 deg. F. an hour before death. On that day a sample of urine removed by catheter was examined. It was very red and turbid with amorphous urates; reaction highly acid. A precipitate of albumen was obtained, amounting, after subsidence for 12 hours, to two-thirds or more of the bulk operated upon. Under the microscope, besides a little scaly epithelium and amorphous urates, numerous tube-casts were seen, mostly filled with dark granular matter, but partly hyaline. No distinct blood corpuscles were detected, but a faint blue reaction with the Guaiac test was obtained.

A post-mortem examination was made on 13th October, 12 hours after death, by Dr. Foulis, whose report is as follows:—

Brain, 45 ozs.; right lung, 1 lb. 6 ozs.; left lung, 11 ozs.; liver, 3 lbs. 9 ozs.; heart, 9 ozs.; spleen, 8 ozs.; kidneys, 12 ozs. Body, examined 12 hours after death, shows rigor-mortis established. The under lip and chin are much swollen, the lip dry, caked, and brown; the chin and lower parts of the cheeks show numerous small purple spots, in the centre of which there is a minute excoriation. The whole body is dotted with minute purple spots, so small as to require close inspection to discover them, and there is also an eruption of pustules the great majority of which are of similarly minute size, while a few are rather larger. One in particular on the inside of the right knee is of the size of an ordinary small-pox vesicle. Chest—both pleuræ are the seat of acute pleurisy, with copious layers of soft lymph. In some of the lymph there has evidently been effusion of blood from the small vessels. The left lung is everywhere of a dark-red colour, and in places a little fluid (reddish) can be squeezed out from the cut surface; the whole tissues of this lung are non-crepitant, and though not devoid of flexibility, present a solid resistance. The right lung is also dark-red in colour, but subcrepitant everywhere. There are in this lung several small solid masses of triangular shape, and mottled red section, which are mostly near the surface; the size is that of walnuts. Heart, normal; no peri- or endo-carditis. Liver, normal. Gall-bladder, normal. Kidneys, pale; the minute venous radicles on the surface injected. Capsule easily removed; here and there are small mottled red and white masses of size of split peas, of same character as those in lungs. Spleen is pulpy of light plum-colour. Stomach, normal. In the cellular tissue behind the gullet is a hæmorrhagic effusion; the minute lymphatics in the gullet are injected in small beaded lines. Intestines, normal; except near the ilio-caecal valve, where there are in the mucous membrane of the ileum, numerous minute round, clear, raised dots, like enlarged solitary glands. Pelvic-organs, normal. The lip on being cut into creaks under the knife, and the whole of the veins in the tissue of the lips and chin are full of pus. The jugular veins do not show pus, nor are the lymphatic glands of the neck much enlarged, though rather congested. Brain is quite normal.

The following history of the illness and death of the foreman of the spinning department, in which C. L. was employed, and which was contemporary with her sickness, must be read in the light of her case. It was taken down by an officer of the Sanitary Department from the lips of a woman with whom he was cohabiting, and is of course necessarily defective.

W. C., aged 22, residing at 173 Mathieson Street, foreman of hair-spinning department. On 2nd October, 1876, complained of a severe pain in his left side. During two following days became worse, but was able to go about. Called at the surgery of the late Dr. Martin, who told him that his stomach was disordered. On the night of the 4th October was very restless, scarcely sleeping any. Sweated heavily and had constant thirst. Got a dose of salts which he vomited. On the 5th was much worse. Bowels moved by castor oil. About 2 p.m. was seen by Dr. William Forrest, who injected morphia into his left side. About 4 p.m. fell out of bed in a convulsion fit, the contortions of his face and limbs being violent. Had to be held in bed by men. Died at 2 a.m. on the 6th. Soon after death his face and neck became black and swollen, and a discharge of blood came from his nose and mouth. Cause of death was certified by Dr. Forrest "delirium tremens."

In answer to my inquiries Dr. Forrest wrote (22nd March, 1878) :—"I find from my note book that the man C. was seen by me twice on 5th October, 1876. I ordered him a mixture such as I was in the habit of giving in delirium tremens. My memory of the case, without notes of any kind to refer to (excepting the record of the visits and the medicine got), is necessarily vague, but so far as I can recall the circumstances, the case presented itself to me as one most probably of delirium tremens. I was told that the man had been drinking. The house looked quite like the home of a drunkard, bare and wretched, and there was nothing about the case to raise the suspicion of any other cause of illness. I remember that the man was in a state of violent delirium when I saw him on the second occasion, being held down in bed by some of his neighbours, and I remember also that I gave him a subcutaneous injection of morphia. On neither occasion was it possible for me to get a satisfactory examination made. Neither my brother nor I have seen any case of sickness of any kind so far as we are aware amongst hair workers, with, of course, the above exception."

It only remains to state that both these persons were engaged in the manufacture of Russian hair at the time of their seizure.

Another case of fatal illness occurred in 1877 among the workers in the same factory. The cause of death is thus registered : "Inflammation of Brain." Duration of illness, three days. No medical attendant. Russian hair was again the material in hand. The following is the statement made to one of my officers. In the absence of medical testimony no better information can be obtained. In this, as in other cases, I preferred accepting inquiries made by a layman, as all chance of leading questions was in this way avoided.

M. H., aged 15, hair-machine feeder, residing at 212 St. James Street, Kinning Park. Her mother, now residing at

154 Crookston Street, states that M. went to her work in her usual health on the morning of 29th May, 1877. She returned about 12 noon, sick, complaining of a severe pain in her head, and shivering. She went to bed and had a dose of castor oil which acted on her bowels once. Vomited constantly, and was very thirsty, perpetually asking for cold water. On the 30th and 31st these symptoms continued with increasing restlessness. On 1st June had three "convulsion fits." There was a pimple upon her left cheek which gave her great pain. It was blue in the centre, with redness round about. She died on that day, no doctor having seen her. Soon after death her body swelled, especially about the head and neck, and became discoloured. Blood oozed from her nose and mouth, and the smell was extremely offensive.

In the course of my inquiries into these deaths I heard of three cases of illness rapidly fatal which had taken place among the workers in another hair factory in the eastern district of the city. The attendant circumstances had evidently impressed the minds of the other hands in the same work, and reached the ears of those employed in the Adelphi Factory. Similar difficulties impair the value of the following narrative of these cases, but the facts were obtained as before through one of the district sanitary inspectors, who was not even aware of the history of the Adelphi cases, and consequently could not put leading questions.

1. M. B., aged 35, wife of a labourer, residing at 5 East Union Street, employed as a teazer in M'Rae's hair factory. From the statements of her husband and of a neighbour woman who had attended her in her last illness, it was ascertained that on 26th December, 1876, she complained of shivering and a severe pain in her side, with general soreness in her bones. She had previously been a strong healthy woman, but had not gone to work for a few days, though no record of complaint of illness can be discovered until the 26th. On the following day she stated she had been very sick, vomiting whatever she took. This sickness continued, the pain in her side getting more severe, accompanied by a dry hard cough and a feeling of great oppression. On 29th December she consented to sending for Dr. Young, of Parkhead, who said she had severe inflammation of the lungs, and ordered a linseed and mustard poultice and prescribed a mixture. He visited again next day, but the pain was much worse and never abated. She died early in the morning of 31st December. Both informants stated that very soon thereafter the face and neck became swollen and black, and blood oozed from nose and mouth. The cause of death was certified and registered "probable pneumonia." This history was read to Dr. Young, who stated

that it was correct, and that he regarded the case as doubtful, being so sudden in its termination.

2. H. J. O., aged 47, widow of a hawker, residing at 28 East Union Street, employed as a hair-teazer in M'Rae's factory.

The following statement was obtained from two female fellow-workers. She had been in the work for 18 months.

About a week before her death she complained of a severe pain in her side, but did not leave her work until the 26th November, 1877. On that morning she began work as usual, but in half an hour had to return home feeling very sick but unable to vomit, and having smart diarrhœa. Next night about 8 she was seen by Dr. Roy, Gallowgate. He said she was a done woman, and had heavy inflammation. He ordered poultices and prescribed. This treatment gave her no relief. The sickness continued, with a gradually increasing sense of oppression and smothering. She died on 28th November. Swelling and discolouration of the face and throat soon set in.

The cause of death was registered, but not certified, "Chronic bronchitis and pleurisy." This statement was read to Dr. Roy, who said that it was correct so far as he knew, and that the woman appeared to be done with bronchitis.

3. E. S., aged 49, widow of a labourer, residing at 28 East Union Street, a hair-teazer in M'Rae's factory.

The following statement was obtained from the same fellow-workers as in the preceding case. They had lodged with Mrs. S., who was apparently a very healthy woman, and had been employed about nine years in the same work. Heard no complaint whatever until between 4 and 5 on the morning of 4th February, 1878. She then said she had had a shivering and been seized with severe pain in her left side, so that she had to get upon her hands and knees in bed in order to breathe easily. About mid-day she managed to rise and dress, and go to the railway station in Queen Street to inquire for a parcel which she expected. In the evening she got home and went to bed. Next day she took a dose of salts and cream of tartar which operated once. On the 6th Dr. John Miller, Gallowgate, saw her about 2 p.m. He said there was severe inflammation of the left lung, and ordered poultices and prescribed. She was very much nauseated, but could not vomit. She was unable to bear the poulticing. On the 7th, about 3 p.m., the doctor stopped the mixture and ordered a tablespoonful of whisky in water every two hours. She was unable to take it, and complained much of a sense of smothering. She died about 8 o'clock that night. The following morning the body was much swelled and discoloured, especially about the face and throat. The cause of death was certified and registered "Inflammation of left lung." This statement was read to Dr. Miller, who said it was correct; that he prescribed the whisky because the patient's face was pale and her lips blue, and said that now he was inclined to regard the case as one of blood-poisoning got from the hair.

I have seen the Messrs. M'Rae, in whose works these women were employed, and found them extremely anxious to give me the fullest information. "Raw Russian manes" were being manufactured at the time of each of these deaths. Although the women are designated teazers, they were put to the picking and sorting when necessary. M. B. and E. S. were certainly so engaged at the time of their seizure, and probably H. J. O. also. The importance of this change is obvious. The teazer is not brought into contact with the material until it has been spun into ropes and boiled, while the picker and sorter takes the hair in its raw condition, and shakes out the rougher impurities, while arranging it as to colour and quality. In this way every part of the bale is handled, the operator bending over it. The Messrs. M'Rae are disposed to regard the sickness and death of M. B. and E. S. as having "something to do with the hair." They were more particularly struck with the case of E. S., who was a very healthy, steady, well-behaved woman, a good worker, and one of their oldest hands. H. J. O., on the other hand, was a delicate woman, regarded as consumptive.

Immediately on the death of E. S., they determined to cease the use of Russian hair, which they say can without inconvenience be entirely dispensed with in the trade. There was a small quantity in stock which they boiled in bulk, before handling it, and then worked up without accident.

The factory is much smaller than the Adelphi work, and not well adapted for the purpose. The buildings are old and badly constructed. The machine shed especially is confined, and the arrangements for collecting the dust and preventing it from impregnating the general atmosphere are rude and insufficient.

Several of the writers quoted who refer to the risks of the manufacture of hair, touch upon the important question of prevention, but excepting in one instance very meagrely. The chief suggestions made are these: Patissier (1) advises that suspected bales should be spread out in the open air, and also treated with sulphur and other acid vapours. The workers who handle it must wash frequently with a mixture of vinegar and water. Ibrelisle (5) says that to purify the hair it ought before manufacture to be boiled with steam, but he very properly remarks that it is a trade question whether this process could be adopted without lowering its commercial value, by impairing its properties of elasticity, &c. He points out that large airy well-ventilated apartments, designed primarily for the business, evidently diminish the risk, as shown by the immunity enjoyed by workers in the trade factories, as compared with the narrated experience of the prisoners who treated the hair in the cells of their prison. Vernois (12) repeats the recommendation to open bales of hair only in the open air, and to ventilate thoroughly the workshops where it is sorted and beaten. Again, under " Crins de Bœuf et de Cheval, soies de Cochon (Preparation des par la Fermentation)," he advises that the store where the bales are kept should have a special ventilating shaft, and that the hands and general cutaneous surface should be carefully inspected to detect the first indications of malignant pustule. Tardieu (13) remarks, that accidents occur much more rarely in workshops which are well ventilated than in those which are not. This, with avoidance of opening the bales in close spaces, and great attention to personal cleanliness on the part of the workers, will suffice to do away with the risk. Bollinger (23) goes to the fountain head of the mischief when he says that the prophylaxis consists essentially in the destruction of all parts of diseased animals, but he adds that the legal enactments prescribed in all civilized countries are very insufficiently enforced and practised. Suitable instruction as to the nature and properties of anthrax should be given to all handicraftsmen who are exposed, and as to the value of the early application of caustic (carbolic acid) to external lesions. The caustic should always be at hand in such works. Proust (25) refers to this matter of " cupidity and carelessness " leading to the clandestine preservation of parts of infected animals. He also states that the activity of the virus is destroyed by a temperature of 60 deg. C., by chlorine water, carbolic acid, and putrefaction. Hirt (24) explains the law of his country on the destruction of diseased animals, but says that all restrictions and attempts at disinfection in regard to foreign hair, &c., imported are worthless.

The report of the Massachusetts State Board of Health on the Walpole outbreak enters fully into the subject of prevention. After a discussion " on the value and application of disinfectants or antiseptics " in general, the writer states that the facts indicate very clearly the importance of resorting at once to energetic measures of disinfection whenever there is reason to suppose that any infected hair exists in a factory. He then summarizes his suggestions thus :

" I. All suspected hair should be thoroughly disinfected, either by boiling for one half hour or by wetting with a solution of carbolic acid in proportions of two ounces to one gallon of water.

"The former process is the one which has thus far been adopted by the proprietors of the Walpole Factory, from the belief that it would be more efficacious. It has been found, however, that boiling the hair extracts a large proportion of the animal oil contained in it, thereby destroying its elasticity, rendering it more difficult to pick and spin, and causing considerable diminution in the weight.

"It remains, therefore, to be decided whether on the whole the application of the acid is not less expensive and equally efficacious, since the weight of hair is not diminished by its use nor its quality impaired. Furthermore, as the hair is invariably boiled in the latter stages of its manufacture, all odour left by the acid must thereby be removed.

"II. The rooms to which the hair has been admitted should be thoroughly disinfected. The roofs and walls should be washed with lime. The floors and woodwork should be washed with water containing soda, and then sprinkled with a solution of carbolic acid. The clothing, boots, and shoes of the operatives also demand attention, as the seeds of the disease may have attached themselves to some of these articles.

"III. Those who are obliged to handle hair suspected of being infected, should previously anoint their hands with a mixture of carbolic acid and lard, in the proportion of one drachm to the ounce" (p. 107).

We are told that a supply of this ointment is kept constantly at hand in all the departments of Walpole Factory.

The reporter claims for these proceedings the credit of the fact that "since a thorough disinfecting process was adopted, but one mild case of the disease has taken place, although a period of sixteen months has now elapsed."

It is evident, on considering the conditions and circumstances surrounding the propagation of anthrax or charbon by hair in course of manufacture, that by any measure short of the exclusion of the contagium they are of a nature such as to render them extremely difficult if not impossible to be fully met by preventive measures. The dangers of dust as a mechanical irritant, varying in intensity according to its physical nature and properties, are well known, and the precautions to be adopted according to the trade or process in the course of which they arise have been well considered and ought to be observed in hair as in other factories and workshops. The general hygienic arrangements of hair factories ought to be as perfect as they can possibly be made. The apartments ought to be roomy and well ventilated. The dust ought to be prevented from mingling with the general atmosphere, and in the machine room, where the "willowing" and carding processes are carried out, the volatile débris ought, by extracting shafts and fanners, to be collected, and finally destroyed by fire. But we have to cope with more than the mere mechanical properties of ordinary dust. The most dangerous part of hair-dust consists of organised particles, the contagium of a subtle animal poison which does not even require to be inhaled, but may by simple contact with the skin fatally affect the workers. It is almost impossible to imagine precautions sufficient to protect workpeople engaged amongst dust having such properties, still more amongst a material impregnated with particles so subtle and active as to be dangerous, apart altogether from visible dust. It seems evident therefore, that the only radical and absolutely trustworthy measures for the prevention of such outbreaks among hair-workers are these :—

1. The prevention of the utilization of the hair of infected animals. It is against the law in most countries, if not all, to utilize the carcases of such animals or any part of them, but everyone knows how difficult it is to enforce such laws in the face of cupidity and ignorance, and they certainly can have little practical effect in such countries as Russia and South America. Nevertheless, the knowledge of such grave facts as those now collected and put upon record may enable the governments of this and other countries to make such representations and remonstrances as may lead to more strict supervision of the collection and exportation of hair, and general enforcement of the enactments as to the disposal of diseased animals and their various products or parts.

In view of the pre-eminence of Russian hair as an observed source of infection the question of entirely prohibiting its introduction is suggested. One result of these occurrences in Glasgow is that two at least of the manufacturers have resolved to have nothing more to do with it.

2. Failing such absolute safety as the exclusion of infected hair would provide, the only other radical precaution is to submit all hair in bulk to some process which would disinfect it, *i.e.* kill the virus which may exist therein, before the hair is disturbed or handled. As pointed out by Dr. Ibrelisle and in the Massachusetts report, this is really a trade question. The possibility of enforcing such a precaution entirely depends upon the effect which such a process would have upon the properties of the hair. At present this Russian hair after carding and spinning is boiled in steam vats for 20 minutes to half an hour, and if dyeing is necessary it is boiled in dyeing before carding, &c., but not before sorting. The question is, could it not all be boiled in bulk? If it could, then no risk would attend its subsequent manipulation. The Massachusetts experience is, however, it is to be feared, enough to decide the impracticability of the suggestion. The Glasgow manufacturers also

state that the boiling lowers the value of the hair, and is employed in fact to turn to account the physical effects of the process upon the hair for trade purposes, viz., " to set the curl." Therefore to employ it at a prior stage of the manufacture would introduce this physical change at a time when it would injure the hair, and probably make it useless for the purpose for which it is intended to adapt it.

We are therefore forced to consider what general precautionary measures can be suggested which would palliate a risk which apparently must attend the manufacture of hair. It is very doubtful, from the transient effects which the observations of Dougall have proved carbolic acid to exercise upon the vaccine contagium, whether its application in solution to the hair in bulk, as recommended in the Massachusetts report, would be efficacious. With the restoration of the hair to the dry condition, which must necessarily precede the stage of further manufacture, would come a renewal of the potential activity of the contagium. I am not aware of any other chemical agent which could be applied in sufficient strength to destroy the contagium without exercising its properties upon the organised structure of the hair, so as also to destroy it.

Apart then from any precautions directly operating upon the material, and always supposing the existence of generally good hygienic conditions in the work, and of special provision for the collection, expulsion, and destruction of the dusty débris from the machine room, the following palliative suggestions may be mentioned :—

1. To prevent poisoning by inhalation, respirators ought to be worn by the hands employed in the machine room, in the spinning room, also in the sorting department. It is, however, a matter of experience that workpeople will not use this simple precaution. The laying aside of respirators on every convenient opportunity, like the unlocking of Davy lamps, would undoubtedly be practised.

2. To prevent poisoning by external contact, bare arms should be prohibited, and close-fitting, high-necked, long-sleeved over-garments of some close texture should be enforced, possibly supplied, left in the works, and regularly cleansed. The application of carbolic lard to the necessarily exposed surfaces, *e.g.* of the hands and face, as suggested in the Massachusetts report, is to be recommended. But from the well-known drying and injurious effect of carbolic acid upon the skin, females would object to use it. Therefore simple lard or camphorated oil would be preferable. Above all things, strict personal cleanliness should be observed. The free use of soap and water applied to the face and arms at each meal hour and at the close of work would be eminently useful.

Ample facilities in the shape of lavatories supplied with all requisites ought to be provided in the work.

No person having any open sore on their person, or having fissures, or any other cutaneous lesion should be employed.

3. To prevent poisoning by deglutition, no eating or drinking within the work or keeping of food on the person or about the factory ought to be allowed. A room for this purpose should be provided, remote from the workrooms, and beyond the possibility of access of dust.

4. Every means ought to be adopted to inform the workers of the risks attendant upon their employment, and of the nature of the contagion to which they are exposed. Caustic in some convenient form ought always to be at hand, ready for immediate application to any suspicious pimple.

P.S.—Since writing the foregoing report, another instance of infection from hair, again of Russian origin, has come under my notice. Two cases of external anthrax on the left side of the neck, in the persons of girls employed in picking and sorting Russian manes in Govan hair works were admitted in July to the Western Infirmary, under the care of Dr. M'Call Anderson. A clinical description of these cases will be found in the "Glasgow Medical Journal" for September, 1879. It is there stated that a specimen of the blood was examined by Dr. Coats. In one case "At first nothing abnormal was observed on microscopical examination, but in the course of a day or two, numerous motionless rod-like bodies were found in the preserved specimen. In the second case, . . . nothing abnormal was observed, either when the blood was newly drawn, or four days after" (p. 215). Very probably, had the local extravascular fluids been examined, the *bacillus anthracis* would have been demonstrated at once. Two other girls, both employed in the spinning department, were contemporaneously attacked with severe vomiting and colicky pains in the bowels, but recovered speedily. The Govan hair works are of modern construction, and are airy and well ventilated. Judging from the raw manes which were being sorted at the time of my visit, the quality was very inferior. The material was a mixture of cow and horse hair, charged with impurities of various kinds, both animal and vegetable.

CHAPTER VIII.

CLINICAL STUDIES.

As has already been stated, the Reports which were issued from Parliamentary Road Hospital contain Clinical Studies of considerable interest, but few probably surpass in importance the observations made on the question of Stimulation in Fevers generally, but especially in Typhus Fever, and on the protective influence of vaccination in Small-pox.

At this period it was commonly held that alcohol served a double purpose in the treatment of fevers—it fed as well as stimulated the patient, and the first paper we have mentioned is a closely-reasoned appeal to the facts of clinical experience as showing that its function was one of stimulation only.

In the second paper the value of vaccination in Small-pox is considered in relation to severity of attack, and the theory is advanced and illustrated by a diagram which has formed the pattern for many subsequent illustrations that protection against the disease wanes with the length of the interval which elapses between vaccination and subsequent exposure to infection, and that the individual "drifts" towards recurring susceptibility to the disease in after years.—(Ed.)

(1) *Stimulation in Typhus.*[1]

I propose to make a study of stimulation as exhibited in 1538 cases of typhus fever treated in the City of Glasgow Fever Hospital between 25th April, 1865, and 1st May, 1867. My object is to show the method and results of a course of practice in which alcohol has been employed as a stimulant.

Everybody knows that alcohol in all its relations is surrounded with doubt, and fruitful of disputation. Is it purely stimulant, or partly food? How does it leave the system, or does it leave the system at all? are all questions concerning the answer to which there are differences of opinion, unfortunately not unbiassed by social and moral considerations. I do not intend to discuss any of the chemical or physiological investigations to which those questions have given rise. It would not influence my practice in the least, although it could be demonstrated that every drop of alcohol is assimilated and detained in the tissues, or that none of it is assimilated and detained. All agree that alcohol is a stimulant, nay more, that its first and most evident action is that of a stimulant. It may or may not be food, but whatever may be the truth in that respect, if not stimulant it is nothing, if a food it is a highly stimulant food. It follows, therefore, that those who give alcohol as a stimulant have all the benefit of whatever nutritive value it may possess, if any, and avoid the evil of narcosis, or impairment of function into which stimulation soon passes, while those who give alcohol as a food are liable to all those evils. All food is stimulant in some degree, but not to a degree which makes this property the chief characteristic. Good beef-tea is decidedly stimulant, and were it so in the sense that alcohol is, then I should give it in fever with the same caution and under the same restrictions as alcohol. A sentence from the writings of Dr. Todd and of Dr. Gairdner will best show the bearing of opinion on this subject upon practice. "Alcohol," says Dr. Todd, "possesses its stimulating property because it is a form of aliment appropriate to the direct nourishment of the nervous system, and to its preservation; and its special adaptation to this system gives it an immediate exciting power superior to any other kind of food." . . .

---

[1] *Glasgow Medical Journal*, 1867.

Dr. Todd would rather over-stimulate than under-stimulate. "I am convinced that it is much better to err on the side of over-stimulation than not to give enough; for if we have over-stimulated a patient, it is very easy to pull him down again; there are plenty of appliances and means for this purpose; but if the patient sink too low nothing is more difficult than to restore him."

Turning to the cases of continued fever detailed by Dr. Todd, the following seem to be peculiarities, but still, such as flow naturally from the preceding. First. There is but a very rude attempt at graduation in the exhibition of stimulants. If any stimulant is given it is almost invariably brandy, and the amount is increased and diminished by gigantic strides, and is always high. Thus, a common procedure is to rise by twelves up to forty-eight ounces of brandy, often to double the amount all at once, one day twenty-four, the next forty-eight ounces. Age, sex, habits, &c., though noted, make really very little difference. The same circumstances arising in a number of patients varying in all their characteristics would meet the same treatment. A girl of eighteen gets forty-eight ounces of brandy every twenty-four hours for days. So do men of fifty or sixty in similar symptoms. Second. As part of this rude differentiation of cases, there is but little explanation ever given of the circumstances supposed to indicate increase or diminution of stimulants. The date of the fever is not noted with care. Often no special reason whatever is given, but merely the statement that the brandy was doubled, or halved and so on.

We take Dr. Gairdner as representing those who use alcohol as what it is without dispute—a stimulant. He says—"I have been throughout guided in the use of alcoholic stimulants by the conviction that they are really *stimulants* and *tonics*—*i.e.* medicines, and not food properly so-called. The maintaining of the opposite view by so high an authority as the late Dr. Todd, and the practice founded upon it of giving these stimulants, as a general rule, at an early period of all acute diseases, and in very frequently repeated doses all through the day and night, I cannot but regard as a grave error, leading to the probability, almost the certainty, of an injurious excess in their use. My own habitual practice has been to give stimulants, if at all, only in very moderate quantities along with the food, and, in general, as an aid to the digestion of food,—the only exceptions being in the case of persons largely and habitually dependent upon stimulants from old and formed habits and in a comparatively small number of acute cases for a very few days, sometimes only a few hours, to help the system over a dangerous crisis, or to co-operate with other needful remedies, such as antimonials in pulmonary inflammation." And again speaking of pneumonia he says, "Stimulants . . . have been freely used in cases in which the vital powers seemed in danger of failing; and that, whatever the treatment in other respects may have been. But . . . I have never given stimulants very largely, or as a matter of routine, or of aliment; almost never in slight cases, or in the early stages of the disease; and very rarely indeed to young persons, or to those not habituated to the use of alcoholic drinks." The practical results of this principle will be best exhibited as the antitheses to those enumerated above as derived by Dr. Todd from his theory.

1. The system of regulated quantities is in the main a bad one. The giving of stimulants is quite a matter of momentary comparative consideration. There rarely are twenty-four continuous hours in which stimulants ought to be given throughout at the same ratio, rarely even six. Cases occur in which it is desirable to visit the patient again and again, and give or withhold according to present circumstances.

2. No rule of thumb of universal application can be given by which to describe cases which ought to be stimulated, much less by which to descry the need of stimulation in the distance. Stimulation is entirely *pro re nata*. The most severe cases may pass through the fever safely without such aid. Mild cases, so far as the absence of those signs of nervous exhaustion described, may require alcohol. I have made various attempts to formulate some phenomena or class of symptoms which demand stimulation, *e.g.* a pulse above 120, but have abandoned them all. The only circumstance which I still regard as a decided occasion for the use of stimulants is irregularity of pulse, and it is on the whole from the heart that nearly all true indications are to be derived, certainly not from functional nervous derangements.

3. Alcohol is, like all stimulants, a narcotic, when given to excess. As a general rule, the problem in fever is to employ the stimulating without eliciting the narcotic effects. Whatever benefit Dr. Todd claims for alcohol as an antidote to or preventive of delirium is to be ascribed to alcoholic narcosis, or, in plain words, the stupefaction of intoxication. I am convinced, from observation, that a fever patient is much more sensitive to both actions of alcohol than a person in health. Half an ounce of port-wine may cause flushing of the face, and general vascular excitement, and that so manifestly, that an intelligent nurse will draw attention to the fact. In other cases, especially children, so small a dose is a narcotic. It produces sleep. When along with a frequent pulse and a weakly acting heart, there is sleeplessness or delirium, alcohol may be employed as a soothing agent with more benefit and safety than opium. Occasionally in adults, under these circumstances, I have even administered as a draught two ounces of whisky made into toddy; with the effect of inducing a comfortable sleep after opiates had completely failed. From these facts I am certain that Dr. Todd's patients who were receiving "from two to twelve, or *even* sixteen drachms" of brandy every half hour, or hour, were in a state of continuous narcosis. This is the clinical fact expressed in the dogma, that alcohol is "the best preventive of and antidote to delirium in acute disease." I cannot believe that perpetual sleep, if artificially induced, is to be desired in fever. An alcoholic sleep prolonged from day to day in a healthy man would certainly injure him. . . . It is a common observation of mine that sleep artificially induced in a fever patient is characterised by a tendency to shallow respirations, congestion of the lungs, rapid feeble pulse, and general evidences of a loss of nervous energy. I believe this condition really is the impairment of nervous energy which accompanies narcosis, and

not the result of want of nourishment, whether alcoholic or food proper. We have the analogy in a case of opium poisoning; and the treatment appropriate to both cases is to rouse from the narcotic sleep, and in the act of rousing, without other aid, the respirations deepen, the pulse gains in strength, and diminishes in frequency and the impaired nervous power is restored.

4. In Dr. Todd's phraseology an alcoholic stimulant is a food. We believe that we cannot employ alcohol as a food without also developing its dangers as a narcotic, and consequently we must resort to those substances more commonly known as food—beef-tea, milk, arrowroot, &c. To these aliments, but not to alcohol, we may apply the proposition and prefer giving too freely to a system of depression. If I am convinced of having done good by giving alcohol as a stimulant, I am convinced of having done harm; and I am quite conscious of having benefited the patient by stopping stimulants, as by administering them even in the same case, when they had been too long continued.

5. In the practice of one who adopts Dr. Gairdner's principles, there will be no such rude gradations in the records of individual cases, no such uniformly high scale of stimulation over-riding all considerations of age, sex, habits, idiosyncrasy, day of fever, &c. Every single dose of alcohol will be regulated in amount and determined as to continuance by a careful study of all those facts. No conceivable circumstance will ever warrant the exhibition of such a quantity as 48 oz. or even 36 oz. of brandy per diem, and the aggregate statistics of such a practice will bear the most delicate traces of the characteristics of the individual cases. I have endeavoured, with increasing fidelity, to follow the indications of those characteristics throughout my practice: and this paper is intended to test by analysis to what extent I have been successful in my endeavour.

It seems to me that, in taking sides in the discussion of a broad question, such as is at issue between those who use alcohol in continued fever as a food, and those who use it as a stimulant, every one before taking up speech ought to show cause why he should be heard. The question is not one regarding minute points of practice, affecting complications or other accidental phenomena of the disease, but refers to its whole course, to the fever as fever. . . . There is hardly any novel practice which may not be pursued, and yet we may be able to quote a few cases as successful, inasmuch as they survived, or to point to moderation in certain symptoms—the fall of the pulse, the absence of delirium, &c—as truly following the practice. But such moderation may follow, and not be an effect, or it may follow and really be an effect; and yet the aggregate result may be bad. Principles which will lead a practitioner to give one to two bottles of brandy, for days together, to lads and girls of seventeen, are not *prima facie* prepossessing. They must be scrutinised before they can be accepted, and nothing short of most decided success over a more innocent creed can warrant their adoption. . . . Of 1538 patients treated 645 were stimulated, and it is with these in their various relations I have to deal. The method pursued in the investigation was to prepare sheets ruled with columns for the following data—Number of cases in Hospital Register, result, day of fever when stimulation began, number of days stimulation continued, total quantity of wine and spirits given, in ounces; and then a series of double columns numbered from the 5th to the 21st day, into which was extended the *daily* amount of wine and spirits given in such cases as the day of the fever had been ascertained. In these sheets every case which had received a drop of alcoholic stimulants in the whole course of treatment was entered, the males and females on separate sheets, each quinquennial period being distinguished. Thus the entire series of 645 cases which were stimulated was arranged in a form which admitted of their classification in all possible ways. The number actually stimulated, not the total number treated, is in all cases the basis of calculation. . . . From five years of age, the proportion stimulated increases gradually, but not steadily. Between 10 and 25 there is the most rapid increase. From 10 to 15, double the number at the preceding period require stimulants; and at the age of puberty the rise is most marked of all periods, being no less than three times the proportion immediately preceding puberty. At 40 there is another sudden rise, with little variation at the ages of adult life between. Above 60 nearly every patient was stimulated. Below 4 the proportion is nearly as great as from 10 to 14, but on examining the individual cases it is obvious that hardly any but fatal cases were stimulated, a fact which gives rise to great doubt how far stimulation at that early age is ever useful, the immediate occasion being generally some complication whose fatal issue is certain. The total quantity administered is surprisingly uniform at all the ages, merely showing, however, that the time over which the stimulation extends is the important, because variable, element to be determined. . . . The doubtful part of treatment is when to begin, how much to give, and how long to continue. The average total quantity consumed by all cases is 22 oz. of wine and 9½ oz. of spirits; the average total cost of this quantity is 2s. 10d. . . . In all inquiries intended to determine the natural course of a disease, we must look to the phenomena observed in those who recovered apart from those who died. Death is an extraordinary event which cuts short the course of the disease, and spoils the fatal case for complete observation, merely leaving the mark of fatality at the particular period in the disease at which death occurred. This is about all the information conveyed by a death relative to the natural history of the disease. . . .

Mortality.—We may say in the most general terms that at all ages fever is more fatal to males than to females. During the reproductive period, from 15 to 40, when adult life is in full vigour, the difference is so marked as from 7 to 18 per cent. in favour of the female. At the beginning of life the risk is about equal to both sexes, between 40 and 54 also it is equal, while at the ages above it is more than twice as fatal to men as to women. The period of least danger may be said to be that immediately preceding puberty in both sexes. It is somewhat remarkable that out of 165 males between 10 and 14, not one should have died. The ages of the three females who died at that age were 12, 13, and 14, showing a tendency of the deaths to the higher parts of the period included. The prognosis, so far as it depends on age, will be with great safety uniformly favourable for patients at that period. The first years of manhood show an increase of danger far beyond the first years of womanhood. Indeed, above 19, her sex seems to advantage the female as much as from 5 to 10 years—*e.g.* a woman of 20-24 runs no more risk than a man of 15-19, and so on up to 40. As regards the male, his sex is in the same degree a disadvantage. However we put it, the importance of the mere fact of sex in prognosis is obvious.

The *percentage stimulated* of each sex gives more information than the mortality alone. It is a measure of the broad impression of the disease upon the general mass of the patients, of the general strain put upon the vitality of the system short of absolutely breaking it. Hence, from the relation of the mortality and the proportion stimulated, as well as from each considered by itself, certain lessons may be learned. Thus, a high mortality coinciding with a high point of stimulation indicates fatality and severity in the fever at that age, while a low mortality with a high point of stimulation means severe but not fatal. The rule is that the mortality and stimulation rise and fall together, both being governed by the same set of circumstances. . . .

Looking at the curves of stimulation for the two sexes first comparatively, it will be observed that while the general percentage is 43.7 for the females and only 36.6 for the males, the percentages at the different ages are decidedly greater among the males at all periods except these, 0-4, 10-14, and most remarkably 20-24. The numbers at the earlier age being small may be neglected. At 10-14 barely four per cent. more females were stimulated than males, a proportion which is fully accounted for by the circumstance already noted, that there were no fatal male cases at that age. With one extraordinary exception, then, females at all ages suffered less from the fever than males. The maximum of stimulation is attained by males ten years before females, *i.e.* at 55. After that age every male was stimulated, but every female not until we reach the age of 65. Everything tends therefore to impart more interest to the fact that at the age of 20-24 no less than 20 per cent. more females required stimulants than males, and to tempt us to a special inquiry into the cause. In looking at the diagram the eye is at once caught by the sudden rise in the female curve, carrying it above the male, as if some aggravating circumstance struck in and at once raised the type of fever to a platform of severity in the females, to which the males do not attain for a period of five years, and which is hardly surpassed in the same sex by the addition of twenty years, for it is notable that the line passes with but little elevation from 20 to 40. The first question which suggests itself is, does the mortality coincide? While in general mortality and stimulation run parallel, there are also exceptions, showing that causes operate at certain ages which produce severity but not fatality. Such a cause marks the period of puberty in both sexes, when the ratio is 1 death to 6.1 stimulated. Passing above that, in the stimulation, we find a nearly doubled mortality, with a lower rate of stimulation, or one death in three stimulated, and this proportion does not vary much in after ages, tending on the whole to fall. I think we may fairly infer from this, that whatever the cause of the mortality, it was something individual rather than general, something which tended to the death of certain cases without being associated with severity affecting the general mass of male patients. Having pointed out that the mortality among females is less, and the stimulation also less than among males, we might suppose this to be an example of the general law of relationship pointed out above; but comparing the ratios in the two sexes, we find that the fall in mortality is in much larger proportion than the fall in stimulation, and that this disproportion is most marked between 20 and 40. Throwing the four periods together, one male died to 2.8 stimulated, but only one female to every 4.8 stimulated. We have here, therefore, evidence of some cause confined in its operation to the female sex, while acting widely makes the constitutional impact of the fever severe but not fatal. This much further is evident, that it is a cause which, while acting widely at certain ages, is not equally active at all ages. Above 40 the ratio is much the same in both sexes and at all periods. At puberty also, as we have just seen, the sexes are alike; in childhood the statistics do not warrant any conclusion. The cause is therefore not in sex merely, though it may be in some passing attribute of. sex. It is not equally active over all the periods between 20 and 40, but most active immediately after puberty, less so in the next period, and about equal in the two last. Prosecuting the inquiry it is forced upon our attention that the period between 20 and 40 embraces in the female the most active part of reproductive life. Typhus fever is a disease which invades every organ and function of the body. It takes the individual, as he or she is, and raises the whole system, with all its redundancies and defects, for the time being to a higher level; so that all is represented, but on an exaggerated scale. The pulse and the temperature vary in health during every twenty-four hours, so that a daily curve can be drawn representing their rise and fall. In fever the curve is reproduced with greater amplitude, but the same outline. A person whose brain in health is active will in fever be delirious, and the subjects of his daily thoughts will assert their old supremacy. The habits, occupations, and social circumstances of large masses of men put their mark on the phenomena of this disease with great distinctness, and it would indeed be surprising if the sexual functions did not leave clear traces of their influence on the general outline of the course of fever, especially at the period of life when those functions are established. On the male side we cannot expect more than indefinite traces of this influence, as the exercise of the function in the male does not necessarily affect the bodily condition. But in woman, menstruation, pregnancy, child-birth, and suckling, alternating throughout the greater part of her life, are all marked by deep constitutional sympathy; and each sets its mark upon the system much more distinctly than any natural process to which the male is exposed. My first step was to classify female patients into the married and the unmarried. At the first three periods the division was easily made, and the results are quite trustworthy; but from the terms of admission to the Hospital (which is chiefly intended for those whose legal support is able-bodied, or who are otherwise not paupers), a great majority of my female patients are married as we advance into the nubile years, and those who are not so are widows, single and not in the main to be selected as patterns of the virtues. Therefore I rely chiefly on those earlier periods. The following table gives a contrast of the married and the unmarried as to stimulation and mortality at four quinquennial periods.

Age.	Total Treated.	Married.					Unmarried.				
		Tr.	Died.	p.c.	Stim.	p.c.	Tr.	Died.	p.c.	Stim.	p.c.
15-19	140	14	...	...	6	42·8	126	8	6·3	48	38
20-24	73	44	4	9	30	68·4	29	2	6·9	17	58·6
25-29	64	47	4	8·5	27	57·4	17	3	17·6	11	64·7
30-34	78	71	11	15·5	47	66·2	7	2	28·6	3	42·8
Total.	335	176	19	10·8	110	62·5	179	15	8·3	79	44·1

The general conclusion of these data is to trace the chief demand for stimulants to the married portion of the female patients. At the age we are more especially investigating the percentage stimulated is 68.4 for married, 58.6 for unmarried. At 30.34 the difference is more marked still, and even among the few married at 15-19 there is a predominance of stimulation. At 25-29 the result tends to an opposite conclusion, though not so decidedly in that direction as at the other ages in the direction we have just pointed out; while, taking the general aggregate of cases, 18 per cent. more married than unmarried females were stimulated. Though a column of mortality has also been given, I do not think any safe use can be made of it at present. We shall be able shortly, after a further selection of cases, to proceed to some inference in this respect also.

Having got thus far in the inquiry, the reflection arose that it is not the mere fact of marriage, but consequent phenomena, which constitute the difference between the two classes of women. Therefore, still proceeding by the method of exclusion, I have carefully gone over my ward journals, and taken note of every case of pregnancy or suckling which has been recorded. I have arranged the result in the following table, in which those distinguished as married are sub-divided

Age.	Total Married.	Pregnant or Suckling.			Neither.		
		No.	Stim.	Per Cent.	No.	Stim.	Per Cent.
15-19	14	9	5	55·5	5	1	20
20-24	44	19	15	78·9	25	15	60
25-29	47	21	11	52·3	26	6	23
30-34	71	20	13	65	51	27	53
35-39	61	17	10	58·8	44	23	52·2
Totals,	237	86	54	62·5	151	72	47·6

into those who were either pregnant or suckling, and those who were neither. The percentage of each sub-division who were stimulated is added.

We thus prove conclusively that the activity of the reproductive function at the time of seizure causes the excess of stimulation which characterizes those periods of age. We prove, however, that whatever influence the fact of past maternity may have, it is the actual condition during the time of illness which gives the most decided bias to the fever. Nearly all those women were mothers of families; but it is not the deteriorating effect of rearing a family so much as the being actually pregnant or actually suckling which renders stimulation necessary. While the general tendency of the percentages at all periods is in this direction, it may be thought that the absolute difference is not so great as it ought to be; but I appeal to these figures more to prove the tendency than to measure the exact amount of its influence in these precise cases. No special care was taken to ascertain the condition of the female patients in this respect, as I had not theory on the subject until it grew out of the present statistical study. No inquiry was made either as to pregnancy or suckling, unless they forced themselves into notice from striking appearances. My conviction is that of the young married women by far the majority were actively productive; and though I desire to adhere entirely to recorded facts and to keep within the limits of my own cases, I may reasonably infer that the same laws were applicable to the married females admitted to this hospital as have been proved regarding the entire married female population. . . .

Having for the purpose of this inquiry tabulated every case of pregnancy and suckling admitted of which note was taken, it may be well to present the results, as tending to elucidate the entire relation of those conditions to typhus fever. They are probably unique in the practice of one hospital. From an examination of various fever-hospital reports, our experience seems much more extensive than usual in this respect.

With reference to this table, observe (1st) how closely the percentage of married females who were puerperal agrees with the tables given by Dr. Duncan in the chapters already quoted[1] for the aggregate of productive women. (2nd) Suckling women more uniformly required stimulation then pregnant women. This is evident at nearly all the ages, and when the totals are contrasted we find that 74 per cent. of the former were stimulated against 50 of the latter. Indeed the suckling woman who has typhus presents a perfectly distinctive appearance to the accustomed eye. Anaemia is a marked condition even in the midst of the vascular activity of the fever. The cutaneous surface, especially as seen in the face, is not hyperaemic, but pale; the rash is not copious nor active; the pulse is feeble and frequent; the asthenia most marked throughout. Among the lower orders a habit of prolonged lactation is very common, frequently extending far into the second year of infant life, and caused partly by the apparent economy of this mode of sustenance, and partly also by certain Malthusian hopes of averting speedy pregnancy. (3rd) The fact of stimulation in pregnancy is chiefly associated with abortion and miscarriage. At the age 20-24 five aborted, and all the five were also stimulated. Of the 46 who were pregnant, 15 or 32.6 per cent. aborted, and of those who aborted 73.3 were stimulated as against 38.7 of those who carried the foetus safely through the fever. (4th) As regards fatality, suckling proved itself the more dangerous condition of the two, 8 per cent. of those who were suckling having died, and 4.3 per cent. of those who were pregnant. It is worthy of remark also that the only two pregnant women who died aborted, and I am inclined to think that the abortion was an accompaniment of the moribund process, and not at all the cause of it. On the other hand, the asthenia which is produced by suckling must be closely associated with the fatal issue as a remote or even a proximate cause. The general result of these two facts—the increased stimulation and the increased mortality—is to establish the proposition that suckling is uniformly an unfavourable element in the prognosis of typhus; while pregnancy does not add much to its dangers. (5th) As to the chances of the foetus in typhus, my experience is that they are most favourable in the intermediate months of pregnancy, between the 3rd and the

---

[1] *Fecundity, Fertility, and Sterility*, by Dr. Matthews Duncan, Part I., c. 1-3.

Age.	Total Married.	Pregnant or Suckling.		Pregnant.				Suckling.				Of Pregnant aborted.		
		No.	Per Cent.	No.	Died.	Stim.	Per Cent.	No.	Died.	Stim.	Per Cent.	No.	Died.	Stim.
15-19	14	9	6·4	4	...	2	50	5	...	3	60	2	1	...
20-24	44	19	26	8	...	6	75	11	1	9	81·8	5	5	...
25-29	47	21	32·8	7	...	1	14·2	14	1	10	71·4	1	...	...
30-34	71	20	25·6	12	1	8	66·6	8	...	5	62·5	3	2	1
35-39	61	17	27·	8	...	2	25	9	2	8	88·8	1	1	...
40-44	44	7	14·5	7	1	4	57	...	...	...	...	3	2	1
45-49	29	3	10·3	...	...	...	...	3	...	2	66·6	...	...	...
Totals,	310	96	31	46	2	23	50	50	4	37	74	15	11	2

7th. Before the 3rd the mother generally aborts, after the 7th generally miscarries. (6th) The prospects of the child surviving in cases of miscarriage are almost nil. They are born with a stock of vitiated blood; and in my experience only one child, born between the 8th and 9th months, survived. Several survived a few days, but this one only—a female—left the hospital in vigorous health. (7th) A condition somewhat different from that of abortion or miscarriage arises when typhus seizes a female immediately after child-birth, at full time. Though a serious, this is not a very fatal complication, which is especially interesting as contrasted with the deadly nature of puerperal scarlatina. One common characteristic of these cases was very marked bronchial irritation. There is always more or less bronchitis in typhus, but in these particular cases it extended deeply into the tubes, and was accompanied by copious secretion. Probably the addition of the effete materials from the degenerating uterine tissue to the poisonous products of the fever imparted an unusually irritating property to the blood. (8th) To complete this summary of the bearing of the generative functions in the female on typhus, I may add that menstruation as a rule has little effect on the progress of the disease. The outset of the pyrexia, if it falls on a menstrual period, generally stops the discharge, if established: but seems not to defer its appearance if not established. The menses appear at all stages, being only influenced in amount. During the last week there is an evident tendency to menorrhagia, which is, however, the general character of all hemorrhages occurring then, and arises from the fluidity of the blood. During convalescence, and until health is established, there is suppression, as in all similar conditions of body, however caused. . . .

Observe (1st) among the recoveries there is a decided increase in the number of days over which stimulation was required, as the patients become older. From 10 to 14, an age which we have shown passes through fever with the greatest immunity, the duration is at a minimum in both sexes—four to five days. From 15 to 19 there is a sudden rise to from 7 to 8 days. Afterwards there is rather a decline until between 30 and 40, when we reach 9 days; and from 50 to 54 there is a maximum of from ten days to a fortnight. The average extent of stimulation over all cases is a week. (2nd) Among those who died there is a great diversity in the duration, a fact from which but little can be learned. It diminishes as the years advance. One remark is suggested by the short average of the fatal cases below ten years. It strengthens the doubt already expressed as to the utility of employing stimulants under such circumstances as are thus denoted. Indeed, I confess for myself to the strength of the inclination to dose plainly moribund cases with spirits, which one does not overcome until experience has given confidence to the judgment. Having said so much for myself, I may venture to add that this is a too common resort of young practitioners, and especially of house surgeons, in emergencies. (3rd) Contrasting the sexes, it is evident that, while the proportion requiring stimulants is, as we saw, generally lower in females than in males, the length for which they require it is longer. At all periods save three this is so. The difference is merely fractional; but in an average of this sort a few decimal figures indicate considerable difference in the actual numbers. The practical effect is that, out of the same number of both sexes receiving stimulants, there will always be a greater number of females receiving them at one time. We shall come upon this fact subsequently.

Closely related to the duration is the amount of stimulants. . . . In order to ensure greater accuracy, I employed the whole number of days and the whole number of stimulants as divisor and dividend. Observe (1st) the relation of the wine and spirits, which will be apparent throughout our investigation. The stronger stimulants were appealed to, as the circumstances demanding their agency became more serious. As we rise in the ages the spirits take the place of the wine; among females wine predominates, to those who died spirits were much more largely given in both sexes than to those who recovered, and to males more largely than to females; all being facts which necessarily result from the administration of alcohol as a stimulant. (2nd) The average total amounts for all ages were about 23½ oz. wine and 8 oz. spirits, to males who recovered; 27 oz., or rather more than one bottle, of wine and 6 oz. of spirits to females who recovered; above 11 oz. wine and 16½ oz. of spirits to males who died; and about 14 oz. wine and 15 oz. spirits to females who died. Absolutely the largest quantity given during the course of the fever to recoveries was given to females between 50 and 54. It amounts to about 13 bottles wine, and 1⅙ bottles whisky. (3rd) No such statements of total amounts are of any value as an index to the pitch of stimulation, unless taken along with the number of days over which they are spread. The columns showing the average daily dose there are therefore the most important. A general survey shows a steady increase in the amount of alchohol as we rise in age, obtained by the increased use of spirits. Running the eye down the column of male recoveries, the daily dose of wine rises from one to two glasses, with but a mere fraction of whisky, until we reach 20. After that age the wine falls again to one glass, while the whisky rises from half a glass to rather more than a glass. Among female recoveries, the wine increases from one to two glasses, and then remains steady at rather less than two glasses, while the whisky does not reach half a glass until we come to 30, and not to a whole glass until we come to 50. The daily dose of alcohol is throughout much less to females than to males; and the females seem to follow the males in absolute amount about a period of five years in arrear, a fact which would correspond to the circumstance already noted regarding the percentage stimulated in each sex at the several periods.

The daily dose for all ages shows but slight traces of this difference, and is of no great value in presence of the detailed averages for the various periods. Taking all recoveries together, it is about 3½ oz. of wine and one of whisky. Turning to the fatal cases, the doses are much larger. The Maximum of all ages and both sexes is 8 oz. whisky per day to males between 30 and 34; but in general the dose was, to males, from one to two and two and a-half glasses of whisky, with one glass of wine; to females, from one to one and a half glasses of whisky, and one to two glasses of wine. Taking all deaths together, the daily dose was one and a quarter glasses of wine, and one and a half glasses of whisky.

Stimulation as related to Day of Fever.—A patient suffering from a specific fever (we might say a specific disease) may be likened to a traveller with a beaten path before him, over which he must toil, every mile of which has its own dangers and its own necessities. Relative to the progress of a case of typhus, each day may be regarded as a stage in the advance either to recovery or to death. There can be no delay, no resting by the way, and according to the traveller's condition as he passes each successive milestone, we judge of his chance of reaching the end in safety, and of the artificial aid he may require to help him on. Hence, to throw metaphor aside, it is of the greatest importance to ascertain the exact date of the commencement of the illness. This is the central fact to which all the phenomena of fever must be referred, that we may estimate correctly their value as a guide to prognosis and as indicative of treatment. There is hardly a symptom which can be interpreted absolutely. A condition which, at one day of the fever, is hopeless, may be quite consistent with recovery at another, and *vice versa*. So also the treatment varies. A matter of such primary importance as stimulation cannot therefore be satisfactorily treated without investigating its relation to the day of the fever. To the study of this relation we have now to address ourselves.

Of the 645 cases which were stimulated in 451 the day of the fever was ascertained, and it is with these 451 cases we have now exclusively to deal. . . . It must be remembered that my chief object is to show the variations according to the day of fever, in the amount of alcoholic stimulants administered. Each day is therefore made the subject of a distinct calculation; the total number actually stimulated on the particular day being the divisor, and the total amount of wine and spirits given on that day to those patients being the dividend. The result is a perfectly accurate average of the dose from day to day. As formerly, the subject branches into three divisions—the number stimulated, the duration, and the quality of stimulants in relation to the day of fever.

Since the value of the actual dose of alcohol administered on any day of the fever, is derived entirely from the relation of the day of the fever to the phenomena of the fever, it will be necessary first to attempt to attach a value to each day in the gradual ascent through which fever tends to recovery or death. In the previous tables it has chiefly been by age and mortality that we have, so to speak, checked the stimulation. Now we have to distinguish nicer grades with less appreciable variations. The progress from day to day is marked less distinctly than that from age to age, and yet as far as this progress is accompanied by shades of severity, so far ought there to be corresponding variations in the degree of stimulation as we have endeavoured to employ it. . . .

The table just referred to (not included) determines the most important days in the course of the fever, those which bring to the patient either a favourable or fatal issue. Observe (1st) as regards the day of crisis, at the age 0-14 nearly half the cases had it on the 12th or 13th days, and a large proportion of the remainder on the 15th. At 15-19 the majority had the crisis on the 13th, and more than two-thirds on the 11th, 12th, 13th, or 14th days together. At 20-29 the crisis was most frequent on the 12th day, but between that and the 13th, and 14th, there is but little difference in frequency. At 30-39 the majority had the crisis on the 14th day, but with little difference between that and the 12th and 13th. At 40-49 a large majority got the crisis at the 11th day, but a considerable number also at the 13th and 14th. At the most advanced ages the crisis fell chiefly on the 14th day, but also in many cases on the two days immediately preceding. Taking all ages together, the most critical day was the 13th; the 12th and 14th approaching very closely, so that the 12th, 13th, and 14th days bring the crisis to nearly three-fourths of all cases. (2nd) There is a distinct postponement of the crisis as patients advance in age. As in all phenomena of fever, the age 15-19 is peculiar in this also that the crisis is on the whole later than at the period immediately following, and it is only then that we have instances of a crisis so late as the 17th day. But the general tendency to delay of the crisis with advancing age, is evident both from the position of the maximum and also from the larger percentages at other later periods. (3rd) Turning to the fatal days, we find that from the smallness of the numbers we can hardly make any inference from the several ages. At 20-29 nearly one-fourth of the deaths occurred on the 11th day, the remaining three-fourths falling on the later days of fever. At 30-39 one-fifth occurred on the 14th day, the remainder being distributed pretty equally over the other days, starting from the tenth. At 40-49 the 10th and 12th are the most fatal days. At the older ages, the 14th is the fatal day, the 9th and 10th following hard after. Taking all ages together, the 15th was the most fatal day, the 10th, 11th, 12th, 14th, and 16th sharing the fatality pretty equally. (4th) A general view of the fatal and critical days suggests the observation that they concentrate towards the same days or groups of days, showing that the same period in the fever brings the crisis to some, and to others death, either closely before or closely after. Thus at 20-29 the maximum of fatality on the 11th immediately precedes the maximum of favourable crisis on the 12th. So also at 40-49 the fatal precedes the critical maximum, while at 30-39 and at the most advanced ages both maxima coincide on the same day. It is worthy of note, that while no deaths occurred at the youngest period after the 12th day, at the remaining ages there is a considerable proportion who, having passed the usual critical and fatal days, still died in the fourth week. These are cases carried off by various sequelae or complications, especially such as affect the chest—pneumonia, pleurisy, &c. To put it in the most general form, the great majority of cases find a crisis or death between the 10th and 16th days, and those who die subsequently are carried off by complications in the 4th week.

Next in importance to the days of crisis and of death stands the day on which the vital powers sink so low as to call for the first administration of stimulants. I have therefore constructed Table VI., showing for certain periods of age, the percentage of the total number stimulated at that age, who were so for the first time on each day of the fever. The percentage of deaths out of the number thus put upon stimulants is given, and will be remarked upon shortly. Meanwhile observe (1st) that at 0-14 the majority of those ultimately stimulated required it by the 9th day; at 15-19 the majority on same day, the 8th not falling far short, so that 44 per cent. of all stimulated required it first on one or other of these days: at 20-29, the majority falls to the 10th; but the 9th approaches so nearly that, between the two 45 per cent. of the whole are accounted for. At 30-39 the majority again falls to the 10th; but on the 8th, 9th, and 10th days together more than half of the whole number went upon stimulants. At 40-49 the majority began on the 9th, but only one per cent. less on the 10th day. At the most advanced ages the majority falls to the 10th day; and, including the 8th and 9th days, nearly 60 per cent. of the entire number are accounted for. Taking all ages together, we find that in 41 per cent. of all cases stimulated, it is commenced on the 9th or 10th days; and, if we include the 8th and 11th days, 68 per cent. of all had within that space been actually put on stimulants. (2nd) Contrasting age with age, there is an earlier demand for stimulants as we near advanced ages. In this, as in other phenomena, the age 15-19 is older than its years indicate. By glancing down the percentages at the eighth day, it will be seen that a larger proportion was put on stimulants, so early as that day, at this period than at any age whatever.

In accordance with the principle enunciated that, to study completely the natural course of a disease, we must consider the recoveries and the deaths separately, I have compiled certain tables which I shall now explain. My first object is to ascertain the prognostic value of the fact of stimulation being required on certain days of fever. To return to the metaphor of a measured journey, if we liken those 451 patients who all received stimulants to a regiment on the march, what are the earliest signs of failure shown by those who will ultimately break down, at what stage is it most ominous for those signs of failure to appear? . . . The conclusion is very evident,—stimulation beginning very early or very late in the fever, is in both cases apt to prognosticate a fatal issue. The former class is composed of those whose strength fails before the journey is well begun, while the latter, few in number, however, comprises such as pass through the fatigues of the fever, but arrive at its close with some serious local lesion, such as pneumonia, pleurisy, gangrene, bedsores, &c. There is a peculiarity in the course of the black line (in a diagram not reproduced) which I cannot explain. Its highest points uniformly fall on even days, the 6th, 8th 10th, 12th, 14th, 16th, and 18th, meaning that it is of more serious import to require stimulants first on an even than on an odd day of the fever. This fact is rendered still more curious when we remark that it is more or less obvious even at the several periods of age, especially 20-29 and 40-49. . . . The result is to show more clearly the early failure of strength which distinguishes the fatal cases, and also to bring out in another way the fact elicited in our endeavour to fix the fatal and critical days—that there are certain points in the progress of the fever where unusual danger awaits the patient, which he may encounter successfully, and so pass the crisis, or unsuccessfully, and so die. The particular result which suggests these remarks in this connection is . . . that the days on which the *largest number*, both of those who recovered and those who died, first showed signs of failure sufficient to require stimulation, are either the same or immediately consecutive. We have already remarked the coincidence of the critical and fatal days, and other illustrations of the same truth will present themselves. . . . It is less hopeful to require stimulants before the 9th day or after the 15th, less alarming at the 9th day, and least alarming of all from the 10th to 14th day.

In order to give expression to the fact of duration in reference to the days of the fever, it is necessary to treat the statistics in a different way. The fact of the commencement has been fully studied : but while some require the artificial support of alcohol for one or two days, others require it for a week or more. If we take note on each day how many men of our imaginary regiment are actually served with stimulants. distinguishing those who recover from those who die, we give expression to this variety of requirement in the aggregate. . . . The maximum of stimulation in recoveries is determined by favourable symptoms, while the maximum of deaths is determined by death, and this coincidence places in the clearest light the fact that death and the crisis are parallel events, the alternative conclusion presented at certain definite periods at each age. In general, the most critical day coincides with that in which the greatest number of individuals was receiving stimulants. The majority, at all ages together, get the crisis on the thirteenth day ; and the majority of those who recovered were receiving stimulants on the twelfth. This consists with my practice, which is, so soon as signs of a crisis appear, to diminish or withhold stimulants. The tendency to subsidence of the symptoms is resisted by the continued exhibition of alcohol, and it is from the beneficial effects of this practice that I state so strongly that I feel satisfied of having done as much good by withdrawing as by giving stimulants, even in the same cases.

In this investigation no account has hitherto been taken of sex. . . . I have already shown that, while, as a rule, of equal numbers of each sex a larger percentage is stimulated of males than of females at some part of the fever, the stimulation is more prolonged among the females than among the males. Hence there is no inconsistency in the two statements. that the fever presses more heavily on the females at the period of climax, and that the percentage of females stimulated is less than of males. The number of individuals stimulated is smaller compared with the number treated, but within the number stimulated the necessity is more continued. . . .

Having now succeeded in obtaining a pretty clear idea of the relative necessities of each day of the fever, as determined by the tendencies to death or recovery, the days of the greatest need of stimulation, &c., all that remains to be done to complete an inquiry, which I fear must have seemed tedious even to the most enthusiastic, is to examine . . . the average dose of wine and whisky administered per day of the fever, *calculated from the number stimulated at each particular day.* My object being to determine the stimulant power employed to sustain the system and to discover how it has been proportioned to the demands of the fever, I have added . . . the value in alcohol of the average dose of wine and whisky as calculated from data furnished by the wine merchant. He informs me that there is 19 per cent. of alcohol in the wine, and 60 per cent. in the whisky. As my object is not to get an absolute but a relative measurement, it is of no importance whether or not these are rigidly accurate data. The same standard being always employed, the result must be correct, so far as the ratio goes. . . . In a general way, the dose expresses all the varying shades of importance which belong to those days. Let us go over the ages seriatim. 0-14, most critical day, the 12th; maximum dose of alcohol also on the 12th. 15-19, most critical day, the 13th, maximum dose on the day preceding. 20-29, most fatal and critical days, 11th and 12th; maximum of alcohol on 13th, with decided increase of power on 11th and 12th days. 30-39, most critical and fatal day, the 14th, maximum of alcohol, 11th, 12th, and 13th. 40-49, most fatal and critical days, 10th, 11th, and 12th; maximum of alcohol, 12th, with great rise on 11th. 50-79, most critical and fatal day, the 14th, with maximum of alcohol on 13th. At all ages, most critical day, the 13th; maximum of alcohol on the 12th. . . . The average dose increases and diminishes *pari passu* with the numbers who required it, the greatest number requiring stimulants on the 12th, the largest dose being on the 12th,—showing both in each individual, and in the grasp of the fever on the mass of patients, a climax of severity.

In writing this paper I have had a two-fold object, both to exhibit as minutely and faithfully as possible the practice pursued, and also to deduce from the statistics of stimulation such information regarding the natural course of Typhus as might be hoped for from the study of the impression left upon those statistics by the circumstances of each case. Although no such classification has been adopted, it may be observed that the various branches of this statistical study fall into two groups. In one we seek for variations in the amount, duration, &c., of stimulation, due to causes which are well known to influence the course of the disease; while in the other we proceed in the opposite direction, and seek to explain certain variations by discovering influences sufficient to account for them. To the former class belong age and sex; to the latter suckling, pregnancy, &c., and partly to both classes our inquiry into the relations of the day of fever to stimulation. The common property through which these and all other circumstances are related to stimulation is in so far as they modify the vital force on the maintenance of which the patient depends for a safe transit along the beaten path of the fever. Alcoholic stimulants are a two-edged sword in the hands of the practitioner. If employed within the range of their stimulant action, *which is variable for every case*, they are helpful; if pushed beyond, into their narcotic action, they impair the vitality, which it is our aim to augment; even as pure stimulants, they may be used unnecessarily, so as to push and urge the labouring energies of the system, maintaining an unnatural excitement in a journey which would with leisure have been more easily accomplished. In any case this definite journey lies before the fever-patient. Whatever the advancement of knowledge may add to the power of the physician, certainly, at its present stage, treatment has no efficiency except as an ancillary to the vitality of the patient. The recognition of this as a fact in the natural history of fever seems to me to be the secret of its successful treatment. In the course of this paper, especially of the latter part, I have pointed out many facts, the tendency of which is to prove that there is a determined course and climax in the disease. Individual differences from age, sex, habits, social circumstances, &c., do not obliterate this periodicity, but at most exhibit it in some as death, in others as a crisis; or again, in a demand for stimulation, marked by intensity, as shown in the numbers requiring it, in the amount required, or in the duration of the requirement; there being always some shock to indicate the arrival at, if not the passage, over a period of natural and inevitable trial to the vitality. The action of the physician is thus limited purely to intelligent and minute observation; to the employment of every means to relieve the constitution of all *impedimenta*, and equip it for a journey which must be traversed; to the acquisition of an intimate acquaintance with every inch of the road, and to the judicious use of such means as are at his disposal to sustain the vitality of the individual until all the dangers are past. There is a certain perennial element of truth in this position. It is external to the system that we must look for the greatest prospective triumphs of medicine over zymotic disease. Prevention will always be better than cure. What Lister seems to have accomplished in Surgery is the perfection of our hopes in Medicine. The poison of typhus has as definite an existence as the poison of the rattlesnake, or as arsenic. We may be able some day to isolate it, as well as them. If we have in carbolic acid, or sulphuric acid, an agent which will neutralize and destroy specific poisons, it still remains true that outside the body the work must be done, to be done effectually. The immediate result of the introduction of these poisons into the system is to set agoing a process of perverted nutrition. The administration of the sulphites, for example, may even destroy the active poison, and stop this process; but, for the completion of the work of cure we must still fall back upon the vitality of the system, and trust to the activity of its functions for the elimination of the morbid products. We may even, therefore, hold it impossible that any advance in the science of medicine can unseat this as the first principle in our treatment of specific disease—the support of the vital energies in their natural tendency through disease to health.

Note.—Since the publication of this paper it has occurred to me that the circumstance that few patients come under hospital treatment before the 6th to 8th day of the disease might be held to vitiate my conclusions as to the day of earliest need of stimulants. Though there is some force in the objection, still, as a fact, shown by the ward-journals, it is very rarely that I found it requisite to stimulate until some days after admission.

(2) *A Study of 972 Cases of Small-pox, with reference to the modifying influence of Vaccination.*

It is of great importance to keep clearly in mind that vaccination is a *process* and not merely an *operation*, as regards the individual. Though the operation may be performed to-day, the person operated upon is not really vaccinated until some days have elapsed. Hence it is *prima facie* absurd to propose vaccination as a mode of *treatment* of Small-pox, or to use vaccine lymph as a medicine or antidote to actual Small-pox. It would be equally reasonable to inoculate a person in whom natural Small-pox was already active. Vaccination and revaccination must be practised as a process through which the system must pass, requiring time for its completion, and therefore to be begun without a moment's hesitation where the system is unprotected, or where it is well to renew the protection.

After closely observing over 1000 cases of Small-pox in hospital, I have become deeply impressed with the helplessness of medicine when face to face with the unmodified disease. In this sense the only successful mode of treating Small-pox is by vaccination. To take firm hold of its efficacy and necessity, and enforce their convictions in practice without wavering, is the most useful, almost the only useful, action the medical profession can adopt against variola. When a case presents itself the first question in prognosis is regarding vaccination, although then the chief work of vaccination has been done, inasmuch as the only other circumstance in the patient's condition which is worth mentioning as affecting the prospects of recovery is the extent of the eruption, which I shall show is the direction in which post-vaccinal Small-pox is chiefly modified. If *vaccinated*, then the attitude is one of hope that the disease may be cut short, however bad present appearances are, though, in fact, the probability is that the symptoms are from the first trivial. If *unvaccinated*, then the attack will probably be severe, the eruption copious or confluent, and we recognise a virulence and deep constitutional disturbance against which the resources of medicine are powerless.

As regards the individual, the opportunity for medical interference is past, and we can only turn his case to profit by following on those about him the practice from the neglect of which he suffers.

I find that the mortality among my unvaccinated cases was 30 per cent., among my vaccinated cases 9 per cent. (1) Therefore by vaccination in childhood the lives of the unvaccinated would have been transferred from a risk of 30 per cent. to one of 9 per cent. (2) But from the statements of the patients or their friends I found that about 60 per cent. of the unvaccinated, and 50 per cent. of the vaccinated knew that they were exposed to the contagion of Small-pox. Therefore. exactly that proportion had, on their own showing, had a clear chance of obtaining protection by primary and secondary vaccination. (3) Above a half of these cases of Small-pox were avoidable : but when we consider that every case had a good lineage of cases derived from it, we may safely say that, mild as the epidemic was in Glasgow, it might with ease have been reduced to a third of its extent, and by a much larger proportion of its mortality, by the prompt use of demonstrated means of prevention. And when we speak of *Small-pox as preventible*, we must remember that we use the word in a much more exact sense than when, in the present state of our knowledge, we speak of *Typhus or Cholera being preventible*. The latter are preventible as the ignition of a dress is preventible by caution, while Small-pox is preventible as the ignition is preventible, by making the fabric of the dress non-combustible.

Being convinced, then, that recent Small-pox experience can be turned to a public advantage only in so far as it can be made to teach the public the benefits of vaccination, and knowing also that, in reference to the phenomena of Small-pox after vaccination, the profession are still necessarily only collecting facts, I have made a special study of the statistics of 972 cases of Small-pox so as to forward those ends. This number includes all the cases admitted to the City of Glasgow Fever (Small-pox) Hospital, Parliamentary Road, from 1st January, 1871, to 30th April, 1872. Previous to the former date, only 11 cases were admitted, and, excepting a few treated at Barnhill Poorhouse, my remarks embrace the entire hospital experience of Small-pox in Glasgow up to the latter date.

TABLE I.

Age.	Total Treated.		Vaccinated.				Unvaccinated.				Odd Cases.	
			V. M. visible.		Said to be but no V. M.		Admitted to be.		No information and no V. M.			
	T.	D.	T.	D.	T.	D.	T.	D.	T.	D.	T.	D.
0-4	39	11	6	...	1	...	30	11	...	...	2	...
5-9	142	21	71	1	4	2	50	15	13	3	4	...
10-19	343	30	228	10	15	1	95	19	3	...	2	...
20-29	337	53	233	20	16	3	76	29	7	...	5	1
30-39	78	22	59	9	5	4	14	9	...	...	...	...
40-49	20	9	15	6	4	3	...	...	..	...	1	...
50-59	8	1	6	1	1	...	1	...	...	...	...	...
60	5	3	5	3	...	...	...	...	...	...	...	...
All Ages,	972	150	623	50	46	13	266	83	23	3	14	1
Percent's,	...	15·4	...	8	...	28·2	...	31·2	...	13	...	...

METHOD OF RECORDING AND CLASSIFYING CASES.

This Table shows those 972 cases as primarily classified with reference to vaccination, and distributed in decennial periods of age. Under this head I shall explain the principle of classification of the cases which form the subject of my remarks, and the precautions taken to insure the accuracy of my facts.

(1) *As to Vaccination.*—If the vaccination marks were visible then their *number* and *quality* were noted. The quality was determined according to the standard described in my paper on "Revaccination," in *Glasgow Medical Journal*,

May, 1871. In the ward journals the quality is described as "very good," "good," "indifferent," "bad," "very bad"; but in my tables I have reduced those degrees to two, viz., "good" and "bad." Sometimes persons were said to be vaccinated, but no marks could be seen, very frequently because of the abundance of the eruption. In some of those cases which recovered an inspection before dismission discovered vaccine marks, sometimes "very good." Those who died, or who were not so examined, are placed in a separate column as "said to be vaccinated, but v.m. not visible." I do not observe in the Reports on Small-pox, as observed in London and Dublin, any allusion to this difficulty. Even the best vaccine mark is readily obscured, or even hidden by a copious eruption, and unless such special means as I have described are adopted, it is impossible accurately to ascertain the facts of Small-pox in the vaccinated. Under "unvaccinated" also there is a separate column in this Table, containing those regarding whom no information could be got, but on whose persons no marks were visible, usually not because of the abundant eruption, but because there was really none. These were no doubt unvaccinated, and are so reckoned for the objects of this paper. A few cases of second attack of Small-pox, also of Small-pox modified by recent primary vaccination, are classified simply as "odd cases."

(2) *The extent of eruption* formed another object of methodical observation. The descriptive terms employed in the ward journals were "rare," "sparse," "copious," "semi-confluent," "confluent," "haemorrhagic." These are all reduced to three categories in this paper, viz.—the "rare," "copious," and "confluent."

INFLUENCE OF VACCINATION ON MORTALITY.

General Mortality.—Of the 972 cases under review, 150 or 15.4 per cent. died. Of these, 669 were vaccinated, and 63 of that number died, or 9.4 per cent., 289 were unvaccinated, and 86 of that number died, or 29.75 per cent. The remainder are classified as "odd cases," 14 in number, with one death. As already stated, therefore, the fact of vaccination without further refinement, reduced the mortality to less than a third.

Influence of Age and Sex on Mortality.—It is obviously well to gauge the amount of other influence which may interfere with our conclusions as to the influence of vaccination. The only ones which seem to demand special inquiry are age and sex, the effects of which are exhibited in the following Table.

The facts of the Table are so obvious as to require but little elucidation. The relative fatality in the sexes is striking, especially among the vaccinated, and at all the ages. These figures are too limited to admit of generalization; but, from the immense field of induction afforded by the statistics of the "Metropolitan Asylum District," which show the same contrast, but in a much less marked degree, I believe it merely to be an illustration of the common law of all epidemic diseases,

TABLE II.

Age.	Vaccinated.								
	Male.			Female.			Total.		
	T.	D.	Per Cent.	T.	D.	Per Cent	T.	D.	Per Cent.
0-4	5	...	...	2	...	...	7	...	...
5-9	36	3	8·2	39	...	...	75	3	4·
10-19	123	6	4·8	120	5	4·1	243	11	4·5
20-29	173	18	10·4	76	5	6·6	249	23	9·2
30-39	42	12	28·5	22	1	4·5	64	13	20·3
40-	19	9	47·3	12	4	33·3	31	13	42
Totals,	398	48	12	271	15	5·5	669	63	9·4

Age.	Unvaccinated.								
	Male.			Female.			Total.		
	T.	D.	Per Cent.	T.	D.	Per Cent.	T.	D.	Per Cent.
0-4	15	4	26·6	15	7	46·6	30	11	36·6
5-9	39	12	30·7	24	6	25	63	18	28·5
10-19	57	10	17·5	41	9	22	98	19	19·4
20-29	69	28	40·6	14	1	7·1	83	29	35
30-39	11	7	63·6	3	2	66·6	14	9	64.3
40-	1	...	...	...	...	...	1	...	...
Totals,	192	61	31·7	97	25	25·7	289	86	29·75

and that the explanation simply is, that men are more weighted in the race than women through more rapid deterioration of staying power, partly from necessary toils and anxieties, and partly from more irregular habits.

Quality and Number of Vaccine Marks in relation to Mortality.—It is evident that, in so far as the success of the operation of vaccination is indicated by the *quality* of the vaccine mark—*i.e.* of the local traces left upon the skin—we should expect to find some relation between the quality of the vaccine mark and the protective influence, as tested by subsequent events. If the operation has been successful, and if we can decide, long after its performance, that it has been so from the local traces left, then we ought to find that in a vaccinated community uniformly exposed to variolous contagion the proportion of those with good marks of vaccination who are attacked is much less than the proportion of those having bad. From the nature of the case there are insuperable practical difficulties in the way of proving this, except very indirectly; but the *protecting* influence of vaccination becomes, in those who do take Small-pox, a modifying influence, and can thus be submitted to various methods of measurement as to nature and duration. We have the unmodified disease as found in those who have never been vaccinated, as a standard, and the extent to which the phenomena of Small-pox, after vaccination, deviate from this standard may be made the subject of exact investigation.[1]

Vaccine marks may be considered as to quality or number simply, or as to number and quality combined, and the modifying influence may be exhibited and estimated in the mortality, or in the extent of the eruption. We are at present looking for it in the *mortality*.

As to *Quality* simply, the following table shows that of 335 persons having " good " marks, 13 or 3.8 per cent. died; while of 156 persons having " bad " marks, 33, or 21 per cent., died. The contrast is apparent at all periods of life, but rises steadily from a minimum in the earliest to a maximum at the latest periods. The mortality of our 289 unvaccinated having been 29.75 per cent., it is evident that badly vaccinated persons are in the aggregate not much better protected from a fatal result than unvaccinated; and looking to the age, the badly vaccinated approach the unprotected condition more and more nearly as they become older.

As to *Number* simply, 491 cases were observed, of whom 46 had died, and it was found that of 313 persons who had only 1 mark, 32 died, or 10 per cent., of 161 persons who had 2 marks, 14 died, or 8.7 per cent., while of 14 persons who had 3 marks, of 2 who had 4 marks, and of 1 who had 8 marks, none died.

As to *Number and Quality combined* when so far subdivided, the data at my disposal are insufficient to warrant any conclusion. The preceding facts as to number of vaccine marks, *without regard to quality*, point to no practical conclusion excepting this, that by introducing vaccine matter into several places on the child's arm, you are more likely to be successful than by introducing it at one only, on the principle which leads a bad marksman to throw a handful of stones instead of one. There can be no doubt that quality is of more importance than number, that it is better to have one really good mark than several bad ones, and that the vaccinator should endeavour to succeed in one or two spots rather than carelessly to insert his lymph in half-a-dozen.

---

[1] Those who are acquainted with the literature of vaccination will not require to be told that all I aim at in this paper is to confirm, and perhaps more vividly illustrate Marson's paper originally published in the *Med-Chirurgical Transactions*, vol. xxxvi. I am not aware of any previous systematic confirmation of his results; and I have elaborated the relation of vaccination to extent of eruption more than Mr. Marson.

TABLE III.

Age.	Total.		"Good" V. M.			"Bad" V. M.			Quality of V.M. not noted	
	T.	D.	T.	D.	Per Cent.	T.	D.	Per Cent.	T.	D.
0-4	6	...	1	...	...	2	...	...	3	...
5-9	71	1	34	...	...	11	...	...	26	1
10-19	228	10	134	5	3·7	50	4	8	44	1
20-29	233	20	123	5	4	64	13	20·3	46	2
30-39	59	9	32	2	6·2	17	7	41	10	..
40-	26	10	11	1	9	12	9	75	3	...
All Ages,	623	50	335	13	3·81	156	33	21·1	132	4

I must confess that, led by the analogy of fevers and other infectious diseases, in which a mild attack, so far as we know, is as protective as a severe one, and on the general principle that the production of a constitutional effect, and not the amount of the specific poison which produces that effect, is the important factor in conferring constitutional immunity. I made my observations with the expectation that quality of mark alone would prove to be of importance. That is to say, I thought that one good mark must be as protective as several. While, undoubtedly, quality is of much greater value than mere number; while a person with one good mark and two bad marks cannot be supposed to be better off than one with one good mark only, nor can any number of bad marks give better ground for confidence than one, except on the rough principle already alluded to, still there are evidences that, in producing the constitutional effect of vaccination, the quantity of the specific poison introduced does bear some relation to the extent of immunity conferred. In coming to this conclusion I have in my mind the elaborate observations made by Mr.

Marson, on numbers sufficient to make his result worthy of notice, and the confirmation of those results, furnished by the experience of the Homerton and Stockwell Hospitals by the Metropolitan Asylum Board, during the recent epidemic of Small-pox. These latter are, that of 632 persons having one good mark 5.3 per cent. died; of 674 persons having two good marks 4.1 died; of 301 having three good marks 2.3 died; and of 259 having four or more good marks only 1.1 died. My own cases showed that of 191 persons having one good mark 8 died, or 4.2 per cent., while of 130 having two good marks 5 died, or 3.8 per cent., and of 13 persons having three good marks, and one having four, none died. My observations therefore coincide with those quoted.

The real meaning of these facts seems to me to be, that *the quantity of a specific poison has something to do with the immunity conferred by the constitutional infection.* The number of vaccine marks can have no meaning excepting in so far as they indicate in a general way the quantity of lymph introduced into the system. It cannot be that the *same quantity of lymph*, introduced into four spots successfully confers more immunity than if introduced into one spot successfully, or that, by dividing a cicatrix into four, its protective value is increased. Hence I am inclined to think that the local and permanent phenomenon which would best indicate the quantity of lymph introduced, and consequently show even more striking relations to the mortality, would be the *superficial area* of good vaccine cicatrices. It seems evident, from Marson's description of his mode of vaccination, that he would produce five good vaccine marks, whose united area would probably little exceed that of one vaccine mark such as is left by the operation as practised at our public vaccine stations in Glasgow. The data for establishing my conjecture as to the area could not be obtained without immense trouble. Still I think the residuum of these observations is this—that it is of great importance in relation to the general etiology of diseases propagated by specific poisons—that *the quantity of vaccine virus absorbed regulates the duration and thoroughness of the constitutional immunity from Small-pox conferred.*

INFLUENCE OF EXTENT OF ERUPTION ON MORTALITY.

A rate of mortality indicates not only the fact of the death of certain individuals, but also the fact of the risk run by those who did not die. A greater percentage of mortality therefore indicates that the persons making up the centum ran a greater risk of death. To measure and exhibit this risk is of importance, but cannot always be done. In Typhus I have employed, as a general indication of the fact as well as a means of estimating it, the proportion of patients stimulated, which rises and falls with the mortality. In Small-pox we obtain a better measurement of risk by classifying patients according to the extent of the eruption. The risk of life is almost absolutely in proportion to the extent of the eruption. By testing the effects of vaccination as shown in the proportion of persons having a certain extent of eruption we shall not only demonstrate a very important clinical fact, but, by appealing to a much wider basis of induction than mere mortality affords, we shall lessen the risk of error, and also bring out in greater relief what may be only faintly shown in the preceding pages.

Mortality from Small-pox directly proportioned to the extent of the Eruption.—In the following table the vaccinated and unvaccinated cases are arranged in three categories, according as the eruption was "rare," "copious," or "confluent":—

TABLE IV. *a*.

Age.	Vaccinated.						Unvaccinated.					
	Rare.		Copious.		Confluent.		Rare.		Copious.		Confluent.	
	T.	D.	T.	D.	T.	D.	T.	D.	T.	D.	T.	D.
0-9	44	...	12	2	1	...	12	...	35	6	29	19
10-19	133	1	54	...	17	9	12	...	34	3	39	13
20-29	125	...	67	5	29	17	8	...	31	3	40	25
30-39	22	...	20	...	14	13	1	...	4	1	8	7
40-	11	...	7	3	10	10	1	...	...	...	...	...
All ages,	335	1	160	10	71	49	34	...	104	13	116	64
Percentage				6·25		69				12·5		55

The result is that only one death took place among those having a "rare" eruption, whether vaccinated or unvaccinated. On referring to the Journal of the Ward, I find that this death was not in any way connected with Small-pox. The patient had chronic cardiac disease, and, after having been walking about for above a week, died suddenly. We may therefore say that *no person having a "rare" eruption dies from Small-pox whether vaccinated or unvaccinated.*

Of those having a "copious" eruption, among the vaccinated 6 per cent., among the unvaccinated 12 per cent. died. Of those having a "confluent" eruption, among the vaccinated 69 per cent., among the unvaccinated 55 per cent. died.[1]

---

[1] This predominance of fatality among the *vaccinated* "confluent" does not affect our present line of inquiry, but it evidently arises, at any rate in part, from the average age of the vaccinated being much higher.

No remarks are required to prove from these statistics that the gravity of a case of Small-pox depends very directly on the extent of the eruption.

INFLUENCE OF VACCINATION ON EXTENT OF ERUPTION.

Vaccination influences the fatality of Small-pox by diminishing the original extent, as well as occasionally checking the subsequent course of the eruption (see Diagram).—The relative proportion per centum of the three degrees of eruption in natural Small-pox, *i.e.* in the unvaccinated, was this :—

Of 254 *unvaccinated persons*

13 per cent. had a "rare" eruption.
41 do. do. "copious" do.
46 do. do. "confluent" do.

On the other hand, the proportion per centum of the three degrees of eruption in modified Small-pox, *i.e.* in vaccinated cases, as shown in the last table, is this :—

Of 566 *vaccinated persons*

59 per cent. had a "rare" eruption.
29 do. do. "copious" do.
12 do. do. "confluent" do.

So that the proportions are more than reversed. While *unvaccinated* people are liable to "confluent" or fatal Small-pox, in the proportion of 46 per cent. of those attacked, 59 per cent., of the *vaccinated* who are attacked, take the "rare," or non-fatal form of the disease.

We have spoken of "good" and "bad" vaccination. Any effect which we suppose vaccination to have, ought to be very decidedly influenced by its quality. That such is the case is shown in this table :—

TABLE V. *a.*

Age.	Good.			Bad.			Quality not noted.	Total Observed.
	Rare.	Copious.	Confl'nt.	Rare.	Copious.	Confl'nt.		
0-9	30	5	...	10	1	1	1	48
10-19	103	24	5	21	20	7	4	184
20-29	87	29	5	21	25	17	3	187
30-39	17	13	2	3	6	8	...	49
40-	8	1	1	1	4	7	1	23
Total, -	245	72	13	56	56	40	9	491

The relative proportion per centum of the three degrees of eruption in Small-pox found in persons who had "good" and "bad" vaccine marks was this, therefore :—

Of 330 *persons having good marks* .

74 per cent. had a "rare" eruption.
22 do. do. "copious" do.
4 do. do. "confluent" do.

While *of* 152 *persons having "bad" marks*

37 per cent. had a "rare" eruption.
37 do. do. "copious" do.
26 do. do. "confluent" do.

We may bring the three gradations of proportions of eruption together as follows, so that at a glance it may be seen how vaccination tends, by reducing the original amount of eruption, to render Small-pox innocuous to life :—

	"Rare."	"Copious."	"Confluent."
Good V.M., -	74 per cent.	22 per cent.	4 per cent.
Bad V.M., - -	37 do.	37 do.	26 do.
Unvaccinated, -	13 do.	41 do.	46 do.

The influence of Vaccination on the extent of the eruption diminishes as the age increases (see Diagram). It is necessary first to determine *what is the influence of age on the extent of eruption in the natural disease?* This is shown in the following table, in which the actual numbers given in Table IV. (*a*) are reduced to percentages of the whole number treated at each decennial period of age : —

TABLE IV. *b*.

Age.	Unvaccinated.			Vaccinated.		
	Rare.	Copious.	Confluent.	Rare.	Copious.	Confluent.
0-9	16	46	38	77	21	2
10-19	14	40	46	65	27	8
20-29	10	39	51	57	30	13
30-39	8	31	61	39	36	25
40-	...	...	...	39	25	36
All Ages,	13	41	46	59	29	12

From this Table it is evident that age alone, or age with the usual average deteriorating influence of vice, hardship, &c., has a decided influence even in the natural disease on the extent of the eruption, and that influence is in the direction of increasing the tendency to confluence. In other words, the older an unvaccinated person is the more risk he runs of having the confluent or fatal form of the disease. Thus, while the proportions per cent. of "rare," "copious," and "confluent" cases are, during the first ten years of life, respectively 16, 46, and 38; during the ten years between thirty and forty, they are 8, 31, and 61, with an intervening gradation. The question therefore is, whether vaccinated persons show a *greater* "drift" than unvaccinated in the direction of confluence.

That in the vaccinated there is very decided "drift" in this direction is evident from the second half of the last Table, in which decennial percentages of the vaccinated also are given. Starting with a proportion of "rare," "copious," and "confluent" cases during the first ten years of life of 77, 21, and 2 per cent. respectively, we reach between thirty and forty years a proportion of 39, 36, and 25 per cent., with intervening gradations. That in the vaccinated there is also a very much greater "drift" towards confluence than in the unvaccinated will be manifest from the following Table, in which I have taken the percentages of the first decennial period as the standard, and have entered at each subsequent period the difference between its percentages and those of the preceding, using a *plus* or a *minus* sign, according as the difference is an increase or a diminution. In this way, at each decennial period after the first, we can see the exact amount of change or "drift" as I have called it, in the distribution of the percentages as compared with the previous period.

TABLE IV. *c*.

Age.	Unvaccinated.			Vaccinated.		
	Rare.	Copious.	Confluent.	Rare.	Copious.	Confluent.
0-9	16	46	38	77	21	2
10-19	−2	−6	+8	−12	+6	+6
20-29	−4	−1	+5	−8	+3	+5
30-39	−2	−8	+10	−18	+6	+12

So that while in the successive decennial periods after the first "drift" towards confluence in the *unvaccinated* shows itself in a falling off of 2, 4, and 2 from the percentage of "rare" eruption, in the *vaccinated* the falling off is 12, 8, and 18. Still it will be noticed that the "drift" for the most part only goes the length of transferring the "rare" into the "copious" in the vaccinated, while in the unvaccinated it ends entirely in an addition to the "confluent."

The *quality* of the vaccine mark may be here again employed as a test of the accuracy of those conclusions. If the modifying influence of vaccination diminishes as the age increases, then it ought to diminish more rapidly in those who are badly vaccinated than in those who are well vaccinated. The following Table is made up on the principle already described of percentages derived from the actual numbers in Table V. (*a*) :—

TABLE V. *b*.

Age.	"Good."			"Bad."		
	Rare.	Copious.	Confluent.	Rare.	Copious.	Confluent.
0-9	86	14	...	84	8	8
10-19	78	18	4	44	42	14
20-29	72	24	4	33	40	27
30-39	53	41	6	18	35	47
40-	80	10	10	9	33	58
All Ages,	74	22	4	37	37	26

During the first decennial period the percentages of the three degrees of eruption are much alike both in the well and in the badly vaccinated, being 84, 8, 8 in the badly, as against 86, 14, 0 in the well vaccinated; but while between 30 and 40 years of age the badly vaccinated have reverted so nearly to the condition of the unvaccinated as to present a percentage proportion of 18, 35, and 47, the well vaccinated still maintain the proportion of 53, 41, and 6 of "rare," "copious," and "confluent" cases respectively.

It is scarcely necessary to gauge the comparative amount of this "drift," except to contrast and exhibit to the eye *the stability of effect of a good vaccination and the rapidly fading effect of a bad one* (see Diagram). This the following Table, constructed from the preceding manner already described, does very clearly :—

TABLE V. *c*.

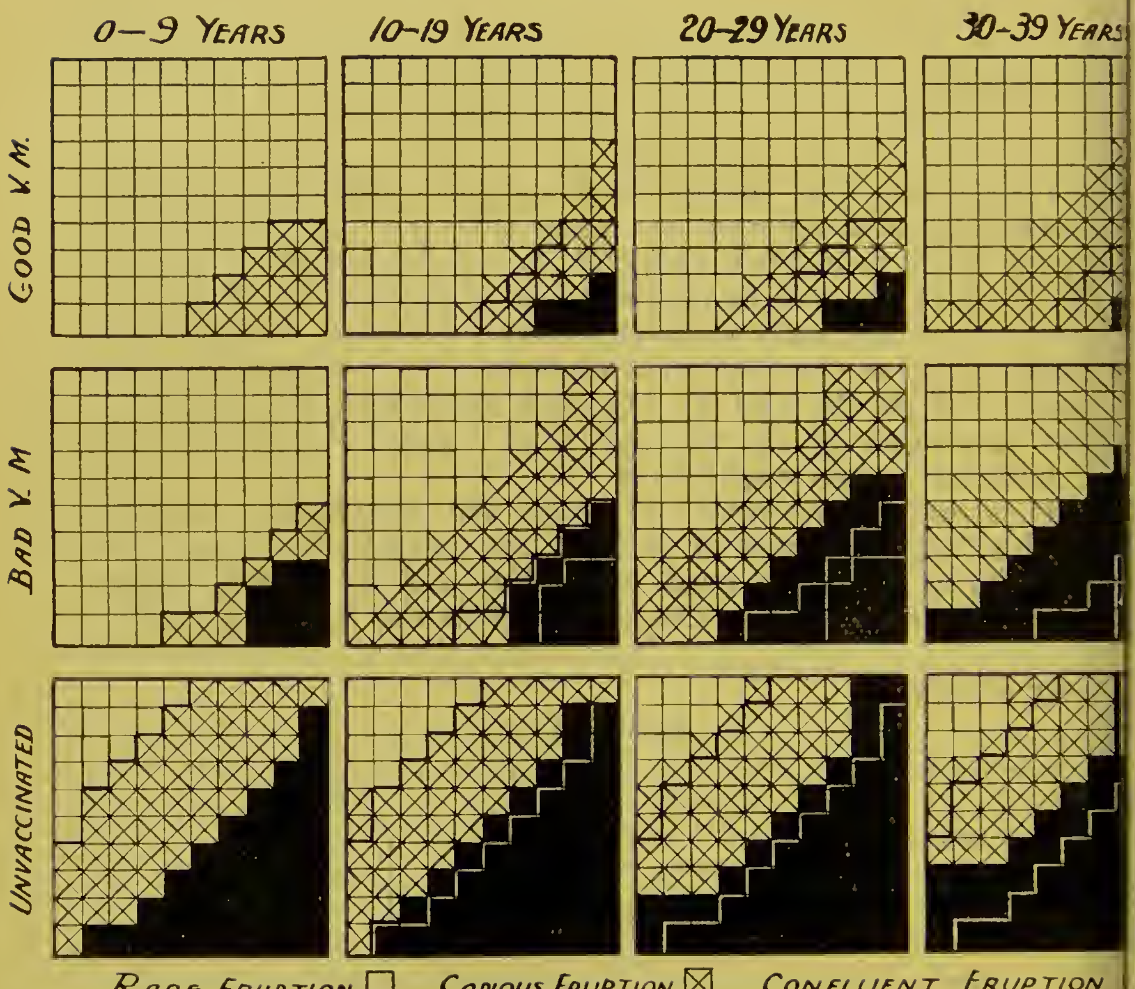
Age.	"Good."			"Bad."		
	Rare.	Copious.	Confluent.	Rare.	Copious.	Confluent.
0-9	86	14	...	84	8	8
10-19	− 8	+ 4	+4	−40	+34	+ 6
20-29	− 6	+ 6	...	−11	− 2	+13
30-39	−19	+17	+2	−15	− 5	+20

It may be said that in well vaccinated persons the amount of the "drift" towards confluence is not greater than age alone would explain until we get above 30 years of age. The badly vaccinated, on the other hand, show excessive instability, and the "drift" above 20 years tends to increase the "confluent" cases at the expense both of the "rare" and the "copious." There are therefore three degrees of "drift" increasing with age—

1st. The *natural "drift"* as seen in the unvaccinated, which is least.

2nd. *The "drift" as seen in the well vaccinated*, which is not greater than the natural drift until we pass the age of 20.

3rd. *The "drift" as seen in the badly vaccinated*, which is greater than the natural drift at all ages.



The large squares contain 100 smaller ones, so that the varieties of the smaller squares represent percentages.

DIAGRAM ILLUSTRATIVE OF REMARKS.

The general design of this Diagram is to exhibit to the eye the variable percentages of "rare," "copious," and "confluent" eruption found at different decades of life, in the *unvaccinated*, those who have a *bad vaccine mark*, and those who have a *good vaccine mark*. The following are the principal points which this Diagram illustrates:—

I. *Vaccination diminishes the original extent of the eruption* (p. 474).—This will be evident to any one who contrasts the squares *vertically*, passing from below upwards, especially in the column "0-9 years."

II. *Age has a slight influence in increasing the tendency to confluence in the natural disease* (p. 475).—The lowest *horizontal* series of squares marked "unvaccinated" shows this. The outline of the original percentages with which we start at "0-9 years" is retained in the subsequent squares by a black line for the "copious" and a white line for the "confluent." In the same way the "drift" of the disease with age is made apparent in all the Diagrams.

III. *The influence of vaccination on the extent of the eruption diminishes as the age increases* (p. 475).

IV. *The influence of a "good" vaccination is very stable, and of a "bad" very unstable.*—Indeed, until we get above 30, the "drift" of those having a "good v.m." does not exceed in amount what is due to age as seen in the unvaccinated; but then those having a "bad v.m." have almost reverted to the proportions of the unvaccinated (p. 477).

The two upper series of squares display all this. Taking those under "30-39 years," it is evident, in the first place, looking to the white and black lines, which represent the percentages at 0-9 years" that the "drift" in the unvaccinated is least, and in those with a "bad v.m." greatest. In the latter the black squares have swallowed up even those which were simply crossed, and have invaded the blank or "rare" squares. The eye at once recognises the gradual assimilation of the squares representing the "bad v.m." to the squares representing the "unvaccinated." Equally readily will a glance show the extreme stability of a "good v.m."

It must be remembered, when we speak of the tendency towards confluence increasing with age in the vaccinated in greater proportion than in those who have the natural disease, that in the vaccinated we set out so to speak from a higher level, and therefore have farther to decline. The proportions of " rare," " copious," and " confluent " cases seen in the natural disease, in the first decennial period of age are exactly reversed in the vaccinated. Therefore this greater " drift " in the vaccinated is in reality the tendency of Small-pox to revert to its natural type. In short, the ultimate issue of this inquiry is to demonstrate, almost to express in exact terms, what I believe to be the fact, that *in the aggregate* the influence of vaccination is unstable. We cannot prove this by finding the proportion of the vaccinated living at each decennial period who, being equally exposed, will take Small-pox; but in those at each decennial period who have taken Small-pox we can find evidence that, as you recede from the point of vaccination, the disease tends to emancipate itself from the modifying power of the vaccination, and to revert to its original type. In other words, the constitutional susceptibility gradually fades. At the same time, it is of the greatest practical importance to remember *how very stable in its effects vaccination may be made by care in the performance of it.* While variola very speedily throws off the modifying influence of a " bad " vaccination, it remains subject to the influence of a " good " vaccination to the latest periods of life. We may be sure that the protective follows the same law as the modifying power. Still these facts, derived from averages, furnish no argument against the revaccination especially in the face of known exposure to contagion, even of those persons who present evidences of perfect primary vaccination. " It is very well for us to know that one person, under inspection, of a certain age, with certain marks, runs so much less risk of proving to be susceptible when exposed to Small-pox than this other person. But so long as we cannot say, you are the individual who will escape, we have no right to leave him even to this diminished risk."

CHAPTER IX.

STUDIES IN VITAL STATISTICS.

WITHOUT some method of measuring results progress in Science is impossible, and the elementary requirements of the science of Vital Statistics are a knowledge of the number of deaths occurring in a given period, and of the population among which they occur.

At an early period the Municipal authorities of Glasgow were keenly alive to the advantages of accurate records of the movements of its population, and there is an echo of still earlier efforts in this direction in Dr. Clelland's report on the plan of Enumeration of the inhabitants of the City and its connected suburbs, which was approved by the Magistrates and Council in 1819.

From this report some extracts may be taken, if only for the interest of the historical associations which they recall.

"There was no enumeration of the inhabitants of Glasgow, that can be relied upon, before the year 1610; but there are grounds for supposing, that, about the time of the Reformation, in 1560, the population might amount to 4500. This estimate of the number is rendered probable from the circumstance that, in 1581, during the ministry of the first Presbyterian clergyman who officiated in Glasgow, the Confession of Faith was subscribed by 2250 individuals; although at that time there were certainly not so many persons in the city who could write, yet they might assent, and even include their children in the number: and the struggle between the professors of the Roman Catholic and Reformed Religion was then so warmly contested that it is probable their numbers were nearly equal.

In 1610, the Episcopal mode of government having been resumed in the Church, Archbishop Spottiswoode directed the population of the city to be ascertained, when it was found to amount to 7644; although, during the plague which raged in Glasgow in 1603, the number of its inhabitants must have been greatly reduced. . . .

In 1660, at the restoration of Charles II., the number of inhabitants amounted to 14,678. . . .

In 1688, at the Revolution the population was reduced to 11,948 : the religious troubles, or what was called the Persecution, which took place at that period, has been assigned as the cause of this decrease.

In 1708, immediately after the Union between Scotland and England, the poulation amounted to 12,766. The Union having been vehemently opposed in Glasgow, the Magistrates directed that an enumeration of the people should be taken, to mark the decrease which they expected would follow.

In 1712, the population amounted to 13,832. This enumeration of the inhabitants was by order of the Convention of Royal Burghs, who had directed the respective burghs to make a return of their population, on oath.

In 1740, the population was ascertained by the Magistrates to be 17,034.

In 1755, the numbers had increased to 23,546; but in this enumeration the suburbs were partially included. . . .

In 1763, the population amounted to 28,300. . . .

In 1780, the numbers had increased to 42,832; but in this enumeration the whole of the suburbs were, for the first time, included.

In 1785, soon after the American War had ended, the Magistrates directed the population to be ascertained, and this amounted to 45,889.

In 1791, the population was ascertained for Sir John Sinclair's statistical work; at that time it amounted to 66,578, including 4633 being part of the suburbs which had been omitted in the return.

GLASGOW AND ITS SUBURBS, 1801.[1]

Houses.			Occupations.			Persons.		
Inhabited.	By how many families occupied.	Uninhabited.	Families chiefly employed in Agriculture.	Families chiefly employed in Trades, Manufactories or Handicrafts.	All other families not comprised in the two preceding classes.	Males.	Females.	Total.
20,276	20,967	1,184	1,834	22,335	43,120	35,007	42,378	77,385

---

[1] These returns were given for parishes, but the details are here omitted.—[Ed.]

Prior to 1801, the general results only of the different enumerations have been preserved; but in that year a Census of the Inhabitants of Great Britain was taken by order of Government.

But in this enumeration a part of the connected suburbs, the population of which amounted to 6384, had been omitted; and which, added to the numbers in the Government Table, makes the actual population of Glasgow at that time 83,769. .

In 1811, there was another Government Census of the inhabitants of Great Britain, according to which the population of Glasgow at that time was as follows:—

GLASGOW AND ITS SUBURBS, 1811.[1]

Houses.				Occupations.			Persons.		
							Males.	Females	Total.
Inhabited.	By how many families occupied.	Building.	Uninhabited.	Families chiefly employed in Agriculture.	Families chiefly employed in Trades, Manufactories or Handicrafts.	All other families not comprised in the two preceding classes.			
17,543	23,567	72	706	544	17,669	53,544	45,275	55,474	100,749

---

[1] These returns were given for parishes but the details are here omitted.—[Ed.]

But in like manner, a part of the connected suburbs had not been included in this enumeration, the population of which amounted to 9711; this number, therefore, added to the Government Table, made the population of the city at that period 110,460."

These repeated references to the population of the suburbs indicate the difficulty which exists of ascertaining the death-rates early in the century because the Bills of Mortality of the period were returns of the burials in the graveyards within the city, irrespective of the place of residence of the deceased persons.

In 1821, an area was agreed upon, including "Glasgow and Suburbs," to which these Bills were to be applied, and this practice continued until the Seventh Police and Extension Act of 1846 incorporated the burghs of Anderston, Gorbals, and Calton with the city, and partly removed the discrepancy. In 1854 the Registration Act was passed.

Hitherto the mortality returns applied to parishes; the Registration Act substituted Registration Districts, which were ten in number. These continued in use till Dr. Strang's death, and in 1864 Dr. Gairdner, at the request of the Sanitary Committee, submitted his views on the future management of the Vital Statistics of the city.

In the Memorandum prepared in response to this request, Dr. Gairdner pointed out that the Registration Districts were too large adequately to reflect the local circumstances influencing health, and as a statistical unit he suggested the Census Enumeration Districts, containing from 70 to 120 families each. These were ultimately, in 1871, grouped into 24 statistical divisions, and in 1873 Dr. Russell, while retaining these divisions for statistical purposes, massed them into larger groups for comparative purposes.

These groups were made up of districts presenting general similarity in their sanitary features, and the comparisons established served to throw into relief the local conditions which were associated with excessive incidence of disease.

During the remaining years of the '70's decade the results were issued quarterly, supplemented by Detailed Annual Reports, till 1879. A Pathological Register also was begun, in which the deaths were classified by street and number for each district of the city. The lack of data, however, from which to accurately estimate the district populations from year to year during the intercensal period, was only partially overcome during this decade by the adoption of the annual return of Inhabited Houses, until the Census of 1881 disclosed the missing factor in the difference amounting to 1½ per cent. between houses " inhabited " but not " occupied."

Hitherto the estimates of population had been in excess of the actual numbers, but the census of 1891 showed that greater accuracy was possible when the number of inhabited houses—subject to the deduction just noted—was used as a basis.

Meanwhile, in light of the facts disclosed by the 1881 Census, Dr. Russell revised the statistics of the preceding decade, and in 1885-6 issued three pamphlets on the Vital Statistics of Glasgow continuing the inquiry down to the year preceding their issue. Although the data on which these were constructed have now undergone considerable modification, many portions of those reports are still valuable as illustrating the practical uses to which local statistics may be applied, and those which appear to be of permanent value are here reproduced.

THE VITAL STATISTICS OF THE CITY OF GLASGOW.

Part I. contains a history of the efforts to establish a satisfactory system of general and district statistics in Glasgow, and the difficulties generally which threaten to impair the value of efforts to estimate the district populations. The relation of town death-rates to density and house accommodation is considered, and the average size of house, the number of inmates, together with the proportion of the population occupying houses of different sizes, is reviewed in detail.

Part II. is devoted to a comparison of the causes of death in the several districts, reference being made to the percentage of uncertified deaths, and the assurance of child lives.

Further consideration is also given to the relationship of house accommodation to death-rates. The new house accommodation of Glasgow is considered, and the air space and height of ceiling in the rooms of the old and new houses are compared. Thereafter follows a description of the original groups of districts, with a comparison of their physical and vital statistics.

Part III. discusses the more general question of death-rates from certain groups of diseases; the bearing of Friendly Societies on uncertified deaths; and the certification of deaths in Glasgow in relation to the facilities for medical attendance.[1] —(Ed.)

Part I. History of attempts to establish a satisfactory system of District Statistics in Glasgow.

In a Report on "The Decennial Census as a Basis for the Statistics of intervening years, illustrated by the case of Glasgow," I showed that the Registrar-General's estimate of the population as compared with the result of the Census, was 89,746 in excess, while my own was 26,608. The former estimate was calculated on the assumption that the rate of increase ascertained at the Census of 1871 for the preceding ten years had continued during the succeeding ten years. The latter was calculated on the assumption that the average number of inhabitants per inhabited house found at the Census of 1871 continued to be the average during the ten years following. Both assumptions were found at the Census of 1881 to have been wrong with the result stated, the error in the local estimate having been aggravated by a mistake in excess of the return of inhabited houses. I also proved that, both in England and Scotland, the Census had shown that the Registrar-General's estimates for the large towns had been more or less wrong. The inevitable inference was that a Decennial Census was insufficient for the purpose of securing a trustworthy basis for the vital statistics of towns in the intervening years.

---

[1] An important pamphlet not here reproduced on "Uncertified Deaths in Glasgow" was issued in 1876. Copies are in the libraries of the Royal Phil. Society (Glasgow) and of the Faculty of Physicians and Surgeons. The subject is afterwards referred to in Pt. III. Vital Statistics.

The subject of my Report was taken up by the Registrar-General for Ireland, in a paper "On Some Important Relations between Census Statistics and Sanitary Statistics," read before the Academy of Medicine in Ireland. He repeated and confirmed my investigation of the estimates of the Registrars-General of England and Scotland, and extended his inquiry to Ireland, with the following result:—

"The conclusion which I arrive at from the foregoing considerations is, that none of the methods at present in use is sufficiently reliable for the purpose of health statistics, the least fallacious being the estimate founded on the average numbers of presumed occupants of inhabited houses. I have, therefore, arrived at the conclusion that, in order to keep death-rates absolutely accurate, it will be necessary to collect facts more frequently than is usually done, and each Sanitary Authority should ascertain for itself the number of residents within its district at intervals much more frequent than the decennial periods. I believe that each year an estimate might be founded on the known number of inhabited houses, and in alternate years, or at triennial periods, a simple enumeration of the population might be made, not such as is taken at the Census, but merely the few facts that are necessary for the striking of death-rates and for the estimation of water-supply, &c., which are so important to Sanitary Authorities."

DIFFICULTY IN OBTAINING TRUSTWORTHY ESTIMATES OF DISTRICT POPULATIONS.

Although I did not push my enquiry in 1881 into the trustworthiness of estimates of the population of districts or subdivisions of towns, it was self-evident that if inter-census estimates of the populations of towns as a whole were wrong, that of any sub-division of them must also be wrong. Any variation between one Census and another in the rate of growth of a town, or in the proportion of the inhabitants to the houses which they occupy, is only the aggregate result of local variations within the town. In some districts there must have been a change by defect of growth or enlargement of the houses, in others a change in the opposite direction; the balance of all such changes being the aggregate change for the whole town. It seems equally obvious that the smaller the sub-divisions are, there is more likelihood of error. If we take the smallest possible division—viz. a single tenement of houses, this will be made most evident. It may be swept away altogether, in which case the population will be reduced to nothing. If a tenement of good middle-class houses, it may be sub-divided into houses of one or two apartments, in which case the population will be greatly increased. In Scotch towns, built on the flatted system, demolitions for railway or general business purposes, or in the course of improvement schemes, must produce much greater local disturbances and redistributions of the inhabitants than in English towns, where the system of occupancy tends to make the inhabitants live more sparsely on the soil.

In Glasgow we have for many years aspired to exhibit the local variations in our vital statistics in sub-divisions more elaborate than have been attempted for any urban community in this country. Previous to 1855, when the Scotch Registration Act came into operation, the mortality returns were treated in parishes; for many years subsequently to that date in the ten Registration Districts. These were too large to possess any sanitary value, being, in fact, determined not for any such application, but with regard to the convenience of the inhabitants fulfilling their duties under the Act, and primarily, so as to be adequate for the support of the Registrars by affording as near as possible equal emoluments from the tariff of remuneration paid by the municipality. After the death of Dr. Strang, Dr. Gairdner was requested to submit his views to the Sanitary Committee on the future management of the Vital Statistics of the City. This he did, under date 19th January, 1864, in a memorandum appended to his Monthly Report. He pointed out that the Registration Districts, embracing populations of 30,000 to 40,000 were too large, and suggested that the 960 Enumeration Districts, formed for the purpose of the Census of 1861, might be taken as the basis for the presentment of the statistics of the city. On further consideration, this minute system of sub-division was found to be too complex, and with the assistance of Dr MacGill, these Enumeration Districts were carefully grouped so as to form 54 Sanitary Districts, each homogeneous in the social position and sanitary circumstances of its population. These were all named, numbered, and carefully laid down upon a map, which was lithographed and submitted to the Board of Police, with a descriptive memorandum by Dr. Gairdner, in October, 1865. The Vital Statistics were arranged in accordance with this scheme, and some use was made of them for various important inquiries, especially in a valuable investigation into the relation of Fever to Overcrowding, in March, 1866, and in a "Report on the Health of Glasgow for the First Quarter of 1869, with Special Reference to the Unusually High Rate of Mortality in March, 1869." But the want of any determination of the population of these districts not only gave as evident indefiniteness to those special official attempts to turn laborious and expensive returns to practical use, but led to premature and illusory calculations of death-rates on the basis of the 1861 population by amateur statisticians, which brought the whole scheme to discredit, and led ultimately to its abandonment. Dr. Gairdner's experience in this praiseworthy endeavour to establish a system of District Mortality Returns are so instructive and so valuable in their bearing upon my present purpose, that I shall quote his own account of them from the Report on the First Quarter of 1869 (p. 4), viz. :—

"I must also give another caution, which observations made at the Board of Police have shown not to be unneeded—viz., that the death-rates for each separate district cannot, in the present state of our information, be deduced from the figures now presented, without much special knowledge, and, after all, at considerable risk of error. Statements have been made, as if upon data furnished by me, in which the unknown increase and the decrease of the population in the different districts since 1881 had been altogether disregarded. Such statements, especially when made upon the narrow basis of a single month's returns, I must characterise as simply illusory : and the repeated quotation in the newspapers and elsewhere, of such utterly untrustworthy death-rates, as if upon good authority, obliges me thus formally to disclaim all responsibility in connection with them. It is necessary, accordingly, that I should explain that the population of the different Sanitary Districts can at present only be made the subject of a very rough calculation : so rough, indeed, that I have not thought proper to insert it in the returns, even as an estimate. Some of the districts, there is reason to think, have increased their population by a third, some by two-thirds, while a few have probably nearly doubled since 1861; and, on the other hand, several districts, owing to the construction of warehouses and shops, or the operations of the City Union Railway and other city improvements, have declined by one-fifth, one-fourth, or even perhaps one-third."

In spite of an appeal to continue the system until the impending Census should afford some trustworthy information as to the population, it was abandoned. In Dr. Gairdner's Annual Report for 1870, the mortality returns were re-arranged in accordance with the five Police Districts of the city, a subdivision which had nothing to recommend it except the fact that the Sanitary Department had been organised for administrative purposes on the same local basis as the Police.

In February, 1871, an important paper was read before the Philosophical Society of Glasgow, by Mr. MacFadyen, a fellow of the Faculty of Actuaries in Scotland on "The Theory of the Death-rate, with Measurements of the Comparative Forces of Mortality in Glasgow and other Cities,"[1] in which he pointed out the uselessness of Registration Districts for such investigations, and advocated the necessity of "what on the Continent is called a Cadaster . . . a minute sub-division of the City, the population to each part, their occupations, ages, birth and death-rates, and all those particulars that students of the public health so much desiderate, but which they so very seldom obtain." Probably stimulated by this paper, the idea of a local sub-division of the City for statistical purposes was revised by the Committee of Health. Dr. Gairdner tried the ten Registration Districts for a few months, but the Committee soon came to the opinion, always held by their Medical Officer, that these were too large and varied in their sanitary and social constitution to afford any information as to the local incidence of disease. Ultimately 24 sub-districts were formed from the Registration Districts; and from 1871 onward these have been maintained. In 1872 I added a re-arrangement of these 24 sub-divisions into four "Groups of Sub-divisions," representing four grades of hygienic and social circumstance. There has thus been recorded from year to year, at the cost of much labour, a mass of facts as to the local distribution of disease in Glasgow such as is not possessed by any other community. The question of their value depends very much upon the accuracy with which the population of each sub-district has been determined in the inter-census years.

---

[1] *Proceedings of the Phil. Society of Glasgow*, 1870-71, p. 437.

METHOD OF OBTAINING DISTRICT ESTIMATES.

These district estimates are based upon returns of the inhabited houses, which I showed in my Census Report[1] were liable to error generally in excess of the truth. But the population is calculated by multiplying the inhabited houses by the average number of inhabitants per house as ascertained at the preceding Census; so that to the possible error in the multiplicand we have added a possible error in the multiplier, for it is quite certain that one element in the local changes which take place from year to year in a city is a change in the character as well as in the number of the houses. This is proved for the whole city in my Census Report, and just as the aggregate increase in the population of the whole city covers enormous local increases and decreases, so the change in the average number of inmates per house, disclosed in successive decennial periods, covers annual local changes of greater amplitude and in different directions.

This investigation has settled the question of the value of any calculations of the birth or death-rates of these districts as a correct basis of comparison of one with another. The actual number of births and deaths, and the proportion of deaths from various causes to the total number remain as certainties, but all calculations on the basis of population must be confessed to be of but little value as hitherto published. That there are enormous differences in the local death-rates remains indisputable as a general conclusion, but the exact amount of those differences cannot be determined from the data as they presently stand and have hitherto been employed.

---

[1] 1881.

AGES OF THE DISTRICT POPULATION.

Even if the difficulties in the way of correctly estimating the total population of the districts could be surmounted, how are we to ascertain the number living at various periods of age? The only method of doing so is to assume that the proportion living at those periods at one Census continues unchanged through each year intervening between that and the next. In my Census[1] Report (p. 22), I discussed this question as regards the total population of the City, and proved that even for it such an assumption would be entirely opposed to the experience of every Census for which we have the necessary data. A comparison of the age results of each Census since 1821 led to the conclusion "that, on the whole, the discrepancy between the last Census and the previous has been less than between any preceding pair of enumerations—*i.e.* the population has been more stable in its composition as to age, the chief change being a smaller proportion of children and a larger proportion of aged people" (p. 24.) Still, when we apply the 1871 proportion to the 1881 population, and compare the number actually enumerated at each period with the number so estimated, we find an error in the population under 1 year of 8.7 per cent. in excess; 1 and under 5 years, of 2.3 per cent. in defect (under 5 years, an excess of 0.42 per cent.); 5 and under 20 years of 0.33 per cent. in excess; 20 and under 60 years, of 0.2 in excess; and 60 and upwards, of 5.5 per cent. in defect. The gravity of these errors is shown by contrasting the respective death-rates for 1881 which these populations would yield. Thus:—

	Under 1.	1 and under 5.	Under 5.	5 and under 20	20 and under 60	60 and upwards
True Death Rate, - -	174	48·5	77	8·8	16	76
Estimated Death Rate, -	158·5	49·6	76·7	8·8	15·9	80

---

[1] 1881.

Even if we had the means of accurately estimating the aggregate population of these districts, we cannot derive therefrom the number living at different periods of age. I have already proved that we cannot thus estimate even the aggregate district populations. Therefore it is utterly impossible from a Decennial Census to construct any trustworthy estimates either of the aggregate or age population of the districts of the City for the intervening years. The only way to obtain a continuous record of district statistics is to have more frequent enumerations of the population.

[Elsewhere it is suggested that this might take the form of a bi- or tri-ennial enumeration, by which the "population factor" of the Inhabited House return might be revised.—Ed.]

THE FUTURE STATISTICS OF GLASGOW.

The method to be followed in presenting the Vital Statistics of Glasgow in the future has given me much concern. It must be quite evident, from the preceding remarks, that with a Decennial Census it is useless to continue, at the cost of much labour, to publish district statistics in the form hitherto adopted. The arrangement of the mere numbers of births and deaths in their districts may be kept up, but the application to them of current estimates of district populations from year to year would be unsatisfactory. This must be deferred until another Census proves whether it is possible to go back upon the tabulated returns on the basis of revised populations. As I shall subsequently show it will, at least at each Census, be possible on the secure basis of the Census, at intervals of 10 years, to take soundings, so to speak, and ascertain the comparative position of each district as shown by the mean death-rate and the chief contributory causes of death in three years—viz., the Census year with the years preceding and following it.

ARGUMENT FOR LOCAL STATISTICS.

Before proceeding with this inquiry, it will be instructive to consider the question—Why is it necessary to compile local statistics? The Registrar-General publishes periodical reports regarding the large towns. Why cannot each town extract from those reports the weekly, monthly, quarterly, and annual statistics referring to itself?

The Registration area has since 1875 been coincident with the Municipal area. Since the national and local statistics now refer to precisely the same population, what necessity is there for local returns at all? The principal reason is this, that the weekly returns of deaths, while they give accurately the number registered, give their *causes* very imperfectly. The Scotch Registration Act permits the registration of deaths without the production of a medical certificate of their cause. Those certificates came in from time to time so slowly that, for three months subsequent to registration, changes are being made by the District Registrars in the diseases originally reported by the parties who registered.

No notice is taken by the Registrar-General of those changes until the Detailed Annual Report is published, *several years* after the Annual summaries, which are issued early in the following year. The current, Monthly, Quarterly, and Annual Summary are derived from the imperfect weekly reports, merely adjusted to the natural months, quarters, and years. Take the present position of our national returns as an illustration. The Detailed Annual for 1881 was published in September 1884, for 1882 in July, 1885. Up to those dates the only information accessible in the national records was the imperfect current reports. The number of deaths in 1881 in Glasgow, according to those reports was 12,904, of which 2599 were uncertified, or 20 per cent. The number of deaths according to the Detailed Annual, published three years subsequently, was 12,916, of which 1190 were uncertified, or 9 per cent. The changes in the distribution of the deaths, arising from the certification in the Detailed Annual Report of 11 per cent. of deaths which were uncertified when the Summary was compiled, are serious, as will appear from the following comparison of the deaths per 100,000 persons living from certain orders of disease, as given in those Reports for 1881 :—

	Annual Summary.	Detailed Annual Report.
Miasmatic Diseases,	382	379
Tubercular ,,	443	450
Brain ,,	238	243
Heart ,,	131	142
Respiratory Organs,	675	666
Digestive ,,	140	140
Developmental Diseases of Children,	98	97
Old Age,	67	61
Violent Deaths,	83	85

This is a sufficient sample of the sort of changes which a comparison discloses throughout the whole category of the classification of diseases. They are obviously such as to deprive the Annual Summary of all statistical value. Yet unless the local health officials go through the enormous labour of classifying from the Registrars' books the deaths in the special districts, they can have no trustworthy information until three or four years after, when the Detailed Annual Reports are issued, and the information has ceased to have any practical value.

At any rate, it cannot be applied to the immediate purposes for which it is required. In England, from the more stringent laws as to registration, the classification of diseases made from week to week is for all practical purposes identical with that published in the Detailed Reports, which are also issued more promptly. In Scotland, even with a less stringent Registration Act, it is not necessary to wait, at any rate so far as the chief towns are concerned, for three or four years. In as many months the causes of death have been certified *finally*, though imperfectly. Consequently a classification can be made up as complete by the middle of the year following the year reported upon, as it can be three or four years later. From this aspect, therefore, viz., to obtain the earliest possible information, local returns must be made up by the local officials of the large towns, and indeed of every local authority desirous of promptly and accurately gauging the health of their district.

CORRECTION FOR INSTITUTIONAL DEATHS.

There is yet another reason why local returns are necessary, which exists both in England and Scotland from a defect inherent in all national registration statistics. These show with perfect accuracy the number of births and deaths in each Registration District, regarded as the place where the birth or death actually took place. But for all the purposes of vital statistics, the births and deaths must be attributed to the locality in which the woman who gave birth to the child and the person who died usually resided. This can only be done by distributing the births and deaths in Institutions and the casual births and deaths occurring away from the usual domicile. A certain number, therefore, of the births and deaths registered within a city such as Glasgow, for example, will be *excluded* by reference to districts outwith the city; a larger number will be referred to other districts within the city. On the other hand, a certain number registered outwith the city will be *included* by reference to districts within the city. The manipulations of the facts as registered chiefly concern births and deaths in Institutions, and are most extensive and important in the case of large towns, where such Institutions are found in greatest number. In Glasgow, in 1881, about 13 per cent. of all the deaths registered took place in Institutions such as Hospitals and the City Poorhouse. Besides, there are the Poorhouses of the Barony, and the Govan Combination Parishes, which are situated beyond the municipal boundary, but a large proportion of the births and deaths occurring in which really belong to Glasgow, and must be included in the Glasgow returns. The net result of all these adjustments, as shown in the total births and deaths finally allotted to the city, does not very seriously disturb the original Registration returns so far as the mere aggregate of births and deaths is concerned. The inclusions and the exclusions to some extent balance one another. The births are generally increased and the deaths diminished. The following shows the actual results for the 4 years with which I shall presently deal : —

	Births.		Deaths.	
	Registrar-General.	Local.	Registrar-General.	Local.
1880	18,912	19,056	13,304	13,303
1881	19,106	19,143	12,916	12,909
1882	19,735	19,792	13,046	12,985
1883	19,869	19,858	14,562	14,476

The Registrar-General's statements for 1880, 1881, and 1882 are taken from the Detailed Annual Reports, those for 1883 from the Annual Summary, but in no case does the difference seriously affect birth and death-rates calculated on the same population. The proportion of illegitimate births in the whole City is slightly increased by the local returns. The *classification* of deaths according to their causes is of course entirely dislocated in the two statements ; so also are their age and distribution. But the most important difference between the two returns is this, that the local returns alone give the true birth and death-rates, the true proportion of illegitimate births, and the true incidence of disease in the different districts of the City.

RELATION OF TOWN DEATH-RATES TO DENSITY AND HOUSE ACCOMMODATION.

Comparison of local statistics is the most fruitful purpose to which they can be applied. Let us take the revised death-rates of the Eight Principal Towns of Scotland for the 10 years, 1871-80, and compare their relative position ; and then place alongside of those mean death-rates the facts of the Scotch Census Tables, which express so much of the physical circumstances of their respective populations as can be displayed in figures. It is undeniable that the inhabitants of towns differ in the physical conditions of health which they enjoy. It is but fair to take those differences into account in comparing their vital statistics. We should never think of any comparison of the agricultural results of two farms of any value unless we had accurate information as to the comparative nature of their soil, the amount and nutritive value of the manure employed, the climate, the method of planting and sowing, the amount of labour expended upon each, and so on. So with towns. When we are asked to estimate the relative import of their death-rates, we must know what we are contrasting. With this knowledge, it is possible that a higher death-rate may be proved in certain circumstances more creditable to one community than a lower death-rate is to another community in certain quite different circumstances.

In the following Table the towns are there arranged in the order of their mean death-rate in the 10 years 1871-80, from the lowest to the highest, and alongside and opposite each town is placed (1) its density per acre; (2) the average number of rooms per house; (3) the average number of persons per inhabited room in 1881; (4) the percentage proportion of the whole population found living in houses of 1 apartment in 1881; (5) the average number of inmates in each 1 apartment house; (6) the percentage proportion of the whole population found living in houses of 5 apartments and upwards; and (7) the average number of inmates in those large houses.

TABLE SHOWING RELATION OF DEATH-RATE TO HOUSE ACCOMMODATION IN EIGHT PRINCIPAL TOWNS OF SCOTLAND.

Town.	Death-rate, 1871-1880.	Density (persons per acre), 1881.	Rooms per house.	Persons per room.	Per cent. of population living in 1 apartment houses.	Average number of persons per 1 apartment house.	Per cent. of population living in 5 apartments and upwards.	Average number of persons in 5 apartments & upwards.
Aberbeen	21·7	18	3·42	1·511	13·6	2·4	18·7	6·9
Leith -	22·5	43	2·98	1·671	14·2	3·0	15·2	6·3
Perth -	22·6	7	4·96	1·312	10·0	2·3	25·7	6·8
Edinburgh	23·2	55	4·19	1·320	16·8	2·7	27·3	6·6
Dundee -	25·7	42	2·85	1·870	16·9	2·7	14·1	11·2
Greenock	27·4	46	2·64	1·907	15·4	3·2	12·0	7·0
Paisley -	27·8	16	2·42	1·984	23·0	3·4	11·4	7·5
Glasgow -	28·6	84	2·34	2·054	24·7	3·1	8·5	7·8

1. *Density.*—Glasgow is the most densely populated of the eight towns, and also the most unhealthy; but when we compare the density and death-rate of the other towns, the relationship is lost. The most sparsely populated town is

Perth, and though among the healthiest, it is not the healthiest. Paisley has a death-rate but little below that of Glasgow, yet in density it is slightly below Aberdeen, which is the healthiest town in Scotland. Edinburgh is among the healthiest of the eight towns, yet in density it comes next to Glasgow, though with a long interval. As to the general relationship of a high density to a high death-rate there can be no doubt. Liverpool is the only town in this country the density of which is greater than Glasgow, and it is the most unhealthy town in Great Britain. The size of a town makes a high density tell more severely on the conditions of health. One acre inhabited by 84 people is not so grave a physical fact as 6000 acres inhabited at the same rate. Again, local knowledge is required to enable us to estimate the exact value of the density as a true expression of the proportion of the inhabitants to the area which is continuously inhabited. Every community has open country around its circumference. If the *whole community* is embraced in a town, then it will always be possible, by taking in within the boundaries of the town sufficient unbuilt space, to reduce the *apparent* density to a proportion only limited in sparseness by the extent of unbuilt space included. If the *whole* community is not embraced in a town, then we are dealing with a *district of a community*, a part of a town, and the density truly represents the amount of earth-space and super-imposed air-space which the inhabitants share. This space truly exhibits the area in which they live and which can contribute to their health and comfort, being streets, squares, open-spaces, distributed over the area upon which their actual dwelling places are distributed. I leave the application of the general principles to the other Scotch towns, so as to estimate the real value of their densities, to those who know their local circumstances as well as I know those of Glasgow. Glasgow, as the term is used for statistical purposes, means a city which is the third in the empire as regards population, and yet it represents only a central district of a community which is more than a fourth larger. The division of the population by the area therefore yields a true density, and a density which is the average of a large area, and therefore develops the gravest importance of density as a physical fact.

2. *The comparative House-Room of the Eight Scotch Towns.* —If we could ascertain the cubic contents of every dwelling-house or room, we should get to the heart of this element of density in the physical circumstances of the inhabitants of towns. This we cannot do, but the Scotch Census includes the number of apartments in each house, and the number of inhabitants found living in each house. Unfortunately, while the English Census gives the number of inhabited houses, it

does not give the number of inhabited rooms in each house. As the definition of a "house" in the nomenclature of the English Census corresponds to what in Scotland is called a tenement, embracing many "houses," in the Scotch acceptation of the term, the average number of inmates per house in English towns is deprived of all social and statistical value. We cannot, therefore, extend to England this investigation into the comparative house-room of urban populations. The facts contained in the table on page 495 are unique in character, and are of supreme social and vital importance.

(*a*) *The average Size of House.*—This is largest in Perth and Edinburgh, where there are 4.96 and 4.19 rooms per house, and smallest in Glasgow, where there are 2.34 rooms. The towns fall, in reference to death-rate and size of house, into two well-marked sets of four—viz., Aberdeen, Leith, Perth, and Edinburgh, with death-rates below 24, and houses of 3 to 5 rooms: and Dundee, Greenock, Paisley, and Glasgow, with death-rates above 25 and houses below 3 rooms. In this group the death-rate rises *pari passu* with the diminution in size of the average house.

(*b*) *Average number of Inmates or Persons per Inhabited Room.*—This follows the average mortality very closely. As a rule, the towns in which the inhabitants are most crowded in their dwelling apartments are the most unhealthy. The four towns which have the highest death-rates are Glasgow, Paisley, Greenock, and Dundee, and these are the four towns whose inhabitants are most crowded in their houses. The crowding and the death-rate increase *pari passu.* The number of persons per inhabited room rises thus—Dundee, 1.870; Greenock, 1.907; Paisley, 1.984; Glasgow, 2.054; and the death-rates rise thus in the same order—25.7, 27.4, 27.8, 28.6 per 1000 of the population. It will be observed that this aspect of density explains the apparent anomaly of Paisley with a density of only 16 per acre, while the death-rate is 27.8. While the other four towns have all much less crowding of the inhabitants in their houses and much lower death-rates than the four specified, Perth and Edinburgh are exceptional, as having less crowding than Aberdeen and Leith, but higher death-rates. Still they form a group by themselves, having, as compared with the other group, much less crowding and a much lower mortality. If we exclude Perth and Edinburgh, it is the fact that in the remaining six towns of Scotland the mortality rises *pari passu* with the number of persons per inhabited room.

(*c*) *Percentage of Population living in Houses of One Apartment.*—This is a social fact of great importance. That the four walls of a single room, whatever the size, is the common space in which all the functions of family life are to be performed, in which life is begun and ended, cannot but have a grave relation to the moral tone of the family. It has evidently also a close relation to physical health. A general survey of the columns of mortality and percentage of population occupying houses of one apartment, proves clearly the general proposition that the higher death-rates are associated with populations having the largest proportion so housed. Putting aside Perth, which has the smallest proportion of small houses, we find at one end of the scale Aberdeen with 13.6 per cent. of its inhabitants living in one room and the lowest death-rate; at the other end, Glasgow with the enormous proportion of 24.7 per cent. and the highest death-rate. The gradation between those extremes may be said to be unbroken. The mortality rises *pari passu* with the percentage of the population in small houses. In another column the average number of individuals living in each one-apartment house is given. Here also there is a general relation between the crowding of one-apartment houses and a higher mortality. The most crowded small houses—viz., those with between 3 and 4 inmates, are found in the most unhealthy towns—viz., Greenock, Paisley, and Glasgow. Aberdeen and Perth, which are the healthiest towns, have absolutely the fewest inmates in their small houses, viz., between 2 and 3. Paisley, which has a death-rate closely running Glasgow for the highest position, has absolutely the most crowded small houses—viz., an average of 3.4 inmates.

(*d*) *Percentage of Population living in Houses of Five Apartments and Upwards.*—This also is a social fact of great importance. It represents physical conditions of life exactly the reverse of those of the percentage living in one room. The two percentages are the complements one of the other. As the proportion of the population living in small houses decreases, the proportion of those living in larger houses increases, and *vice versa*: and we have a parallel measurement of the average physical and moral conditions of life in the community. A general survey and comparison of the columns in the table shows this clearly in the close association of high death-rates with a low proportion of the population living in spacious houses, and of low death-rates with a high proportion. The four unhealthiest towns have the four lowest percentages of their inhabitants spaciously housed; the four healthiest towns have the four highest percentages spaciously housed. Edinburgh has absolutely the highest proportion of its population living in houses of 5 apartments and upwards— viz., 27.3 per cent., and it has a mean death-rate of 23.2 per 1000; while Glasgow has absolutely the lowest proportion—viz., 8.5 per cent., and it has a mean death-rate of 28.6 per 1000. Perth has a proportion but little below Edinburgh—viz., 25.7 per cent., and the death-rate is only a little higher—viz., 22.6 per 1000. In another column the average number of inmates in these large houses is given, and the same relation between crowding of large houses and high death-rates is apparent, as in the case of small houses. The most crowded large houses are found in Dundee, viz., over 11 inmates per house, and it is in the unhealthy group of towns, though not prominently so. Glasgow has, with the exception of Dundee, the most crowded large houses—viz., 7.8 inmates. In general, it is the fact that the most crowded houses, both large and small, are associated with the highest mortality, and the least crowded with the lowest. Although this is but following into the detail of houses of different sizes, the relation of inmates to house which is summed up and expressed for each town in the average number of persons per inhabited room, it develops a new fact in the association of a high mortality with a high average. A large proportion of large houses lowers the average per room, and a large proportion of small houses raises the average; but in towns which have the highest averages and the highest mortality the overcrowding arises from some cause which influences all grades of the population to minimise their house-room. That cause may be *res angusta domi*; straitness of circumstance, which imposes this tendency upon the inhabitants, or it may be a low estimate of the moral and physical importance of house-room which leads them to sacrifice the desire for fresh air and decency to the gratification of lower appetites, such as drink or dress. Whatever the cause may be, its influence is shown not only in selecting small houses, but in crowding houses of all sizes.

3. Let us endeavour to sum up the facts in the preceding pages in the form of *an apology for Glasgow*. It is, no doubt, still the unhealthiest town in Scotland; but there is no town in Scotland with which we can fitly compare it. The population of Glasgow is nearly two and a quarter that of Edinburgh, and considerably larger than that of the other six towns added together. In England, we have, excluding London, only Liverpool above it in population and in density. Liverpool, Glasgow, and Manchester are the three most densely populated towns in the country, and Glasgow is in recent years the healthiest of the three.

Let us now confine our remarks to the eight Scotch towns with which comparisons are naturally made as their relative death-rates are published from time to time. Glasgow is, as I have said, enormously the largest of the eight. It is also enormously the densest. At the Census Glasgow had a population of 511,532, living on an area of 6111 acres; Edinburgh a population of 228,190, living on an area of 4180; and the other six towns a population of 462,970, living on an area of 20,097 acres! Not only are the inhabitants of Glasgow more crowded upon the soil than in any other Scotch town, but they are the most crowded in their houses. Glasgow has the largest population living in one-room houses, and the smallest, very much the smallest, living in houses of the largest size. Let us make a precise comparison between Glasgow and Edinburgh as to house room. In Glasgow there are 2.054 persons on an average living in each inhabited room, in Edinburgh 1.320; in Glasgow 25 per cent. of the population live in houses of one apartment, in Edinburgh 17 per cent.; in Glasgow 8½ per cent. of the poulation live in houses of five apartments and upwards, in Edinburgh above 27 per cent.; in Glasgow there is an average of 3.1 inmates in each one apartment house, and 7.8 in each house of five apartments and upwards; in Edinburgh 2.7 and 6.6. It is impossible to exaggerate the difference in the physical, moral, and social circumstances of the populations of Glasgow and Edinburgh. In 1881 there were in Glasgow 126,264 persons living in houses of one apartment, and 228,629 living in houses of two apartments, while the whole population of Edinburgh was only 228,326. We may well ask—Is it to be wondered at that the mean death-rate of Glasgow was 28.6 and of Edinburgh 23.2?

Part II. The Districts of Glasgow.

The opening pages of this Part are devoted to a discussion of the District Statistics of Glasgow on the basis of the mean results of the three years, 1880-1-2; these years being selected because the central year of the period, being a census year, afforded a true mean population. Thereafter their physical contrasts are considered in detail.—(Ed.)

We began this survey of the Districts of Glasgow with "Blythswood," which was remarkable as having the lowest proportion of inmates per inhabited room, the largest proportion of large-sized houses, the lowest death-rate, the lowest birth-rate, the lowest mortality under 5 years, the lowest proportion of deaths under 1 year per 1000 born, and the lowest proportion of Irish-born. We end it with "Bridgegate and Wynds," which has the largest proportion of inmates per inhabited room, the largest proportion, save one, of 1 apartment houses, the highest death-rate over all, the highest death-rate under 5 years, the largest proportion of deaths under 1 year per 1000 born, and the highest percentage of Irish-born inhabitants.

This District lies between Stockwell Street and Saltmarket on the west and east, and Trongate and Clyde on the north and south. The Union Railway occupies the very centre. Between the clearances necessary to its formation and the operations of the Improvement Trust, this District has been, so to speak, disembowelled. Still, in those portions which remain, we find a population the like of which for social and moral degradation is not to be found in the city. Their houses, though much has been done for them, are radically bad, and total demolition and reconstruction is the only remedy. To enumerate those plague spots would simply mean to catalogue all the wynds, narrow, noisome streets and closes of this unhappy area, and to bring once more into public notice names which have been the heartbreak of successive generations of Glasgow philanthropists.[1]

COMPARATIVE DISTRICT MORTALITY.

[A Table not reproduced brought together the death-rates of the Districts at all ages, and under 5 years, in the periods 1871-2 and 1880-1-2.]

The comparison shows that *in all the* Districts the general death-rate was much lower in the latter period than in the former; and that in all the Districts, except Cowcaddens, the death-rate under 5 years was also much lower in the latter period than in the former. This result is important, as proving that the displacement of the inhabitants of the central parts of the city has not deteriorated the health of the Districts into which they have removed. It was proved by special investigation that the people whose wretched houses were demolished by the Improvement Trust distributed themselves over the city.[2] It is often said that the habits of these people are such that, go where they please, they will not be better of the change. It is evident, however, that they found physical conditions so much more conducive to health, that whether or not their habits have been improved, undoubtedly their health has been, in their new residences. The moral is to persevere in the destruction or improvement of the houses of the people. The certain result is to improve their health.

The Districts which had the *lowest* death-rate in 1880-1-2 had the *lowest* also in 1871-2, viz., Blythswood and Kelvinhaugh and Sandyford; while the District which had the highest death-rate in 1871-2—viz. High Street and Closes (W.), was lower than six other districts in 1880-1-2, Bridgegate and Wynds having then the absolute *highest* death-rate, and having been next to High Street and Closes (W.) in 1871-2. As to the death-rate under 5 years, the same two Districts which were *lowest* in general death-rate in both periods were also lowest in infantile mortality in both periods—viz., Blythswood and Kelvinhaugh and Sandyford. In both periods the same District held the unhappy position of being the *highest* in infantile mortality—viz., Bridgegate and Wynds.

---

[1] The 1897 Improvement Act included all the remaining portions of this district.

[2] See Chapter V.

[A similar contrast is then shown in (*a*) Diseases of the Lungs, (*b*) Consumption, and (*c*) Infectious Disease.]

DISTRICT PERCENTAGE OF DEATHS UNCERTIFIED.

The large proportion of the total deaths in Glasgow, the causes of which are not certified by any Medical Attendant, is a fact of serious moment, to which attention has frequently been directed. Of all the deaths in the city in the three years 1880-1-2, there were 9 per cent. uncertified. When we compare the Districts as to certification, the gravity of the facts disclosed cannot be overestimated. In Kelvinhaugh and Sandyford, and in Kingston, only 3 per cent. of the total deaths were uncertified, while in the Bridgegate and Wynds no less than 25 per cent. were uncertified. The same districts are highest and lowest in the proportion uncertified below 5 years of age. In Kelvinhaugh and Sandyford only 5 per cent., in Kingston only 4 per cent. of the deaths under 5 years were uncertified, while in Bridgegate and Wynds the proportion was no less than 40 per cent! Above 5 years of age Kelvinhaugh and Sandyford only 1 per cent., in Kingston and Laurieston only 2 per cent. were uncertified, while in Bridgegate and Wynds and Brownfield 15 per cent., and in St. Enoch Square 16 per cent. were uncertified. Taking infantile deaths, we find that in Kelvinhaugh and Sandyford 8 per cent. were uncertified, and in Bridgegate and Wynds no less than 57 per cent! These facts mean (1) *that to the extent of these percentages we have actually no accurate knowledge of the causes of the mortality in those Districts*, and (2) *that to the extent of these percentages fatal cases of sickness in these Districts have no effectual medical attendance.* The first inference stands absolutely without qualification or possibility of question. The second may be slightly modified, because it can be shown, from the statements made to the Registrars by relatives, that while the greater number of persons whose deaths were not certified had "no medical attendance," a certain proportion were said to have been so attended, although the alleged attendant would not certify when asked, and a larger proportion were stated to have been seen by someone in their last illness at a Dispensary, whether private or public. Still, let us take Bridgegate and Wynds, and calculate the proportion of those who died in this District who were admitted to have had no medical attendance in their last illness, and the following are the facts :—There were 884 deaths in 1880-1-2 in this District, of which 175, or 20 per cent. occurred *without medical attendance*. Dividing these according to the age of the deceased, below 5 years and 5 years and upwards, we find that below 5 years there were 364 deaths, of which 112, or 31 per cent., occurred *without medical attendance*; while at five years and upwards there were 520 deaths, of which 63, or 12 per cent., occurred *without medical attendance*.

DISTRICT CERTIFICATION OF CHILD LIFE AND ILLEGITIMACY.

If we follow these facts into the comparative non-certification of Legitimate and Illegitimate children, their suggestiveness becomes dark and dismal. The proportion of illegitimate children is *lowest* in Kelvinhaugh and Sandyford, St. Rollox and Springburn and Maryhill, in each of which it is only 5 per cent. of the total births, the city mean being 8. It is *highest* in that District conspicuous for everything that is bad—viz., Bridgegate and Wynds, 22 per cent. In the whole city 32 per cent. of the *Illegitimate* children who died before the end of their first year were uncertified, against 18 per cent. of the *legitimate* children. In the whole city 22 per cent. of the *illegitimate* who died between their first and fifth year were uncertified, against 8 per cent. of the *legitimate* children. When the total numbers for the city are distributed into Districts they become too small to yield trustworthy calculations at any rate in the smaller Districts. Still we find in the best District, Kelvinhaugh and Sandyford, this contrast under 1 year—uncertified *illegitimate* 11 per cent., *legitimate* 8 per cent.; and in the worst District, Bridgegate and Wynds, *illegitimate* uncertified 61 per cent., *legitimate* 55 per cent. In the most populous District, Hutcheson Square, where the numbers are amply adequate as a basis for calculations, the contrast is very striking. Under 1 year, *illegitimate* uncertified 26 per cent., *legitimate* 11 per cent. Above 1 year and under 5 years, *illegitimate* uncertified 21 per cent, *legitimate* 6 per cent.

DISTRICT INSURANCE OF LIVES IN FRIENDLY SOCIETIES.

The prevalence of Insurance of Lives in Friendly Societies in Glasgow is remarkable. In the whole city 45 per cent. of all who died were so insured. Under 5 years the proportion was 40 per cent., and above 5 years 49 per cent. The practice is most common in the working class Districts. In St. Rollox the *highest* portion is found—viz., 58 per cent. In Springburn and Maryhill the proportion was 57 per cent., in Greenhead and London Road 56. The *lowest* proportion was 29 per cent. in St. Enoch Square. In Kelvinhaugh and Sandyford there was 35 per cent., and in Bridgegate and Wynds 32 per cent., showing, as we might expect, that providence is not one of the virtues of that unhappy district. The proportion insured below and above 5 years of age points to the same conclusion. The *highest* under 5 years was 51 per cent. in St. Rollox, and 50 per cent. in Springburn and Maryhill; the *lowest* was 26 per cent. in Blythswood, and 28 per cent. in Bridgegate and Wynds. The *highest* above 5 years was 70 per cent. in Port-Dundas, 64 per cent. in St. Rollox, and in Springburn and Maryhill; the *lowest* was 30 per cent. in St. Enoch Square, and 35 per cent. in Bridegate and Wynds.

HOW DISTRICT DATA AS TO SIZE OF HOUSE AND OCCUPANCY ARE OBTAINED—THEIR IMPERFECTIONS.

Some explanation is necessary as to the method of calculating the data of which I propose to make so much use, as a gauge of the circumstances of the District populations as to the cardinal element of air space—viz., the mean number of rooms per house and of persons per room. In Part I. of this Report I showed how closely the mean death-rates of the Eight Principal Towns of Scotland, for the 10 years 1871-80, followed these data. In comparing towns, it is necessary to make the calculations from the total population, the total number of inhabited houses, and the total number of rooms in those houses, including under the designation "house," all institutions and other inhabited buildings. This is necessary, because no distinction of dwelling-houses, properly so-called, from institutions, is made in the aggregate statistics of towns. It is also statistically sound, because all towns, in their entirety, may be taken to have the same relative admixture of such institutions. But when we come to divide towns into districts, the case is different. In some districts there are institutions, in others none; all the inhabitants are dwellers in private houses. Unfortunately, though we can exclude the larger institutions, we cannot exclude the smaller. For this reason, the District data as to mean size of house and occupancy are in many instances vitiated as pure expressions of the house accommodation of the private householders. This is especially true of all the more central Districts. The Registrar-General classified as "Institutions," those only which were inhabited or anticipated to be inhabited, by over 200 inmates, in 1881.[1] In some cases the inmates were found to be at the date of the census, somewhat below the anticipated number; but with these exceptions, *all institutions having under 200 inmates were classed as "houses."* There are still other vitiating elements in the calculation of these important data as regards the districts of towns. All hotels, common lodging and boarding-houses are included as private houses. These also are most numerous in the more central districts. All these qualifications of the purity of our data as representing the facts as to private dwellings only must be taken into account. The "institutions," as artificially defined are excluded, with their rooms and inmates, also ships and their crews; but there remain, of varying proportion in the Districts, all institutions having below 200 inmates, all hotels, boarding and common lodging-houses. Some Districts, especially the circumferential, are practically free from these disturbing elements; but in others they must seriously tell, and the smaller the District the more seriously—*e.g.* (12) St. Enoch Square, and (10) St. Andrew's Square. In both there are large hotels, lodging-houses, and some minor institutions, with a residential poor population; and hence we have a death-rate which seems abnormally high when we look at the relatively favourable position of those Districts as to mean size of house and occupancy.

RELATION OF SIZE OF HOUSE TO OCCUPANCY OR PERSONS PER ROOM.

The mean number of rooms per house in the city in 1881 was 2.322, and the mean number of persons per room 2.040.[2] To get rid of fractions we may say that in 1000 average houses there were 2322 Rooms, and in 1000 of these Rooms 2040 inhabitants. The former we shall designate the "Standard House," and the latter the "Standard of Occupancy."

First let us consider the *Relation of Size of House to Occupancy or Persons per Room.* There are 8 Districts which have houses the mean size of which is *above* the size of the "Standard House," and that the same 8 Districts have rooms *below* the "Standard of Occupancy." There are also 16 Districts which have houses the mean size of which is *below* the "standard House," and the same 16 Districts have rooms *above* the "Standard of Occupancy."

---

[1] See p. 3 of my *Census Report* (1881) for explanation and criticism of variable meaning of "Institutions" in Census nomenclature.

[2] These figures are also exclusive of "Institutions."

From these facts we deduce the following :—

STANDARD OF OCCUPANCY.

That the smaller the house, the greater the number of inhabitants per room; or, in other words, the smaller the house the less cubic space per inmate. *Vice versa*, therefore, the larger the house the fewer the number of inhabitants; or, in other words, the greater the cubic space per inmate per room.

Density.—In describing the Districts we pointed out that the density was, as a rule, fictitious from such causes as the area devoted to public parks, the extent of as yet unbuilt ground, and the presence of railway stations, large public works, &c., &c. No one, however, will dispute the fact, that the larger the houses the lower the true density, and the smaller the houses the higher the true density. This is a recognised fact in the economics of house provision, but it is practically impossible to calculate the true density of small areas of towns. We call the fact to remembrance here because it intensifies the hygienic gravity of the "law of occupancy."

We have therefore two sets of Districts, the one of which has *Houses* the mean size of which is *above* the size of the "Standard House," and Rooms which are inhabited *below* the "Standard of Occupancy"; the other of which has houses and rooms, which as to size and occupancy, are the reverse. The following are the names and numbers of those two sets of Districts.

1. Eight Districts having houses *above* the standard house as to size, and below the standard as to occupancy— viz. (in the order from *lowest* upwards of persons per 1000 rooms, Table p. 57) Blythswood; 17, or Kelvinhaugh and Sandyford; 12, or St. Enoch Square; 1, or Exchange; 9, or Monteith Row; 15, or Woodside; 19, or Kingston; 10, or St. Andrew's Square.

2. Sixteen Districts having houses *below* the standard house as to size, and *above* the standard as to occupancy—viz. (in the order from the lowest upwards of persons per 1000 rooms, Table p. 57) 5, or Bellgrove and Dennistoun; 21, or Hutcheson Square; 22, or Gorbals; 13, or Brownsfield; 18, or Anderston Proper; 4, or St. Rollox; 20, or Laurieston; 11, or Calton Proper; 3, or High Street and Closes (W.); Springburn and Maryhill; 8, or Barrowfield; 7, or Greenhead and London Road; 6, or High Street and Closes (E.); 16, or Cowcaddens; 2, or Port-Dundas; 14, or Bridgegate and Wynds. We shall now contrast these two sets of Districts as to their Vital Statistics.

RELATION OF DISTRICT DEATH-RATES TO HOUSE ACCOMMODATION.

The mean death-rate of the City was 25.2 per 1000 inhabitants. We shall call this the "standard death-rate."

Of the 8 Districts having houses *above* the standard house as to size, and *below* the standard of occupancy, *all except one* had a death-rate *below* the standard death-rate.

The exception was District 10, or St. Andrew's Square, which had the smallest houses and the highest number of occupants per room in this group of districts, and a death-rate of 28.7. We have already suggested an explanation of this exception.

Of the 16 Districts having houses *below* the standard house as to size, and *above* the standard of occupancy, *all except four* had a death-rate above the standard death-rate. The exceptions were Districts 5, or Bellgrove and Dennistoun; 21, or Hutcheson Square; 4, or St. Rollox; and Springburn and Maryhill. We shall defer our observations on these exceptions until we have completed our survey of the relation of various other items in the Vital Statistics of the Districts to house accommodation.

RELATION OF DISTRICT DEATH-RATES FROM ACUTE DISEASES OF THE LUNGS TO HOUSE ACCOMMODATION.

The mean Death-rate of the City from *acute diseases of the lungs* was 579 per 100,000 inhabitants (5.79 per 1000). We shall call this the "standard death-rate from acute diseases of the lungs."

Of the 8 Districts having houses *above* the standard house as to size, and below the standard of occupancy, *all except one* had a death-rate from acute diseases of the lungs *below* the standard death-rate. The exception was again District 10, or St. Andrew's Square, which had the smallest houses, and the highest number of occupants per room in this group of districts, and a death-rate of 748 from acute diseases of the lungs.

Of the 16 Districts having houses *below* the standard house and *above* the standard as to occupancy, *all except four* had a death-rate from acute diseases of the lungs above the standard death-rate. The exceptions were Districts 5, or Bellgrove and Dennistoun; 4, or St. Rollox; Springburn and Maryhill; and 7, or Greenhead and London Road.

RELATION OF DISTRICT DEATH-RATES FROM CONSUMPTION TO HOUSE ACCOMMODATION.

The mean death-rate of the City from *consumption* was 301 per 100,000 inhabitants (3.01 per 1000). We shall call this the "standard death-rate from consumption."

Of the 8 Districts having houses *above* the standard house as to size, and *below* the standard of occupancy, *all except one* had a death-rate from consumption *below* the standard death-rate. The exception was again District 10; or St. Andrew's Square, which had a death-rate of 343 from consumption.

Of the 16 Districts having houses *below* the standard house as to size, and *above* the standard of occupancy, *all except six* had a death-rate from consumption above the standard death-rate. The exceptions were Districts 5, or Bellgrove and Dennistoun; 22, or Gorbals; 4, or St. Rollox; 20, or Laurieston; Springburn and Maryhill; and 2, or Port-Dundas.

RELATION OF DISTRICT DEATH-RATES FROM ACUTE DISEASES OF THE LUNGS AND CONSUMPTION TOGETHER TO HOUSE ACCOMMODATION.

The mean death-rate of the City from *acute diseases of the lungs* and consumption was 880 per 100,000 inhabitants (8.8 per 1000). We shall call this the "standard death-rate from acute diseases of the lungs and consumption."

Of the 8 Districts having houses *above* the standard house as to size, and below the standard of occupancy, *all except one* had a death-rate from acute diseases of the lungs and consumption *below* the standard death-rate. The exception was District 10, or St. Andrew's Square, which had a death-rate of 1091 from these diseases.

Of the 16 Districts having houses *below* the standard house as to size, and *above* the standard of occupancy, *all except four* had a death-rate from acute diseases of the lungs and consumption *above* the standard death-rate. The exceptions were Districts 5, or Bellgrove and Dennistoun; 4, or St. Rollox; Springburn and Maryhill; and 7, or Greenhead and London Road.

RELATION OF DISTRICT DEATH-RATES FROM INFECTIOUS DISEASES TO HOUSE ACCOMMODATION.

The infectious diseases are fever (typhus, enteric, undefined), small-pox, scarlet fever, measles, whooping-cough, croup, and diphtheria. The mean death-rate of the City from these diseases was 343 per 100,000 inhabitants (3.43 per 1000). We shall call this the "standard death-rate from infectious diseases."

Of the 8 Districts having houses *above* the standard house as to size, and *below* the standard of occupancy, all had a death-rate from infectious diseases *below* the standard death-rate.

Of the 16 Districts having houses *below* the standard house as to size, and above the standard of occupancy, *all except four* had a death-rate from infectious diseases *above* the standard death-rate. The exceptions were 5, or Bellgrove and Dennistoun; 4, or St. Rollox; 3, or High Street and Closes (W.); and Springburn and Maryhill.

RELATION OF DISTRICT BIRTH-RATES TO HOUSE ACCOMMODATION.

The mean birth-rate of the City was 37.3 per 1000 inhabitants. We shall call this the "standard birth-rate."

Of the 8 Districts having houses *above* the standard house as to size, and *below* the standard of occupancy, *all except one* had a birth-rate *below* the standard birth-rate. The exception was 15, or Woodside, which had a birth-rate of 39.4.

Of the 16 Districts having houses *below* the standard house as to size, and *above* the standard of occupancy, *all except five* had a birth-rate above the standard birth-rate. The exceptions were 22, or Gorbals; 13, or Brownfield; 20, or Laurieston; 3, or High Street and Closes (W.); and 14, or Bridgegate and Wynds. Of these, however, Districts 22 and 20 had a birth-rate only 0.1 and District 14 only 0.2 *below* the standard birth-rate. Of the 11 Districts above the standard birth-rate, District 8, or Barrowfield, was only 0.1 above it. These four Districts may, therefore, be said to have had the standard birth-rate. The 16 Districts may therefore be classified thus: 10 *above*, 2 *below*, and 4 *at* standard birth-rate. A high birth-rate clearly goes with small houses and crowded rooms, but the exceptions require elucidation, which we shall defer at present.

RELATION BETWEEN DEATH-RATE UNDER ONE YEAR PER 1000 BORN AND HOUSE ACCOMMODATION.

The death-rate under 1 year, calculated per 1000 born, is one of the most accurate and delicate tests of health and social well-being. It is the most accurate because both the deaths and births, to the standard of which the deaths are reduced, are correctly ascertained. The enumeration of the population, in which error is always possible, does not enter into the calculation. It is the most delicate, both because the successful nurture of children through their first year of life implies the highest social virtues, and because at that tender age vitality is acutely sensitive to the physical conditions surrounding the infant.

The mean death-rate of the City per 1000 children born was 148. We shall call this the "standard infantile death-rate."

Of the 8 Districts having houses *above* the standard house as to size, and *below* the standard of occupancy, *all but three* had an infantile death-rate *below* the standard.

The exceptions were Districts 9, or Monteith Row; 1, or

Exchange, and 10, or St. Andrew's Square. As District 9 had an infantile death-rate of 149, it may be said to be *at* the standard.

Of the 16 Districts having houses *below* the standard house as to size, and *above* the standard of occupancy, *all but four* had an infantile death-rate *above* the standard. The exceptions were Districts 5, or Bellgrove and Dennistoun; 21, or Hutcheson Square; 4, or St. Rollox; and Springburn and Maryhill.

RELATION BETWEEN DEATH-RATE UNDER 5 YEARS AND HOUSE ACCOMMODATION.

The mean death-rate of the City under 5 years per 1000 living under that age was 82.1. We shall call this the "standard child death-rate."

Of the 8 Districts having houses *above* the standard house as to size, and *below* the standard as to occupany, *all but two* had a child death-rate below the standard. The exceptions were Districts 12, or St. Enoch Square, and 10, or St. Andrew's Square.

Of the 16 Districts having houses *below* the standard house as to size, and *above* the standard of occupancy, *all but four* had a child death-rate above the standard. The exceptions were Districts 5, or Bellgrove and Dennistoun; 21, or Hutcheson Square; 4, or St. Rollox; and Springburn and Maryhill.

RELATION BETWEEN ILLEGITIMACY AND HOUSE ACCOMMODATION.

The number of illegitimate children among every 100 born in the City was 8. We shall call this the "standard of illegitimacy."

Of the 8 Districts having houses *above* the standard house as to size, and *below* the standard of occupancy, there were *four* Districts below the standard of illegitimacy—viz., 17, or Kelvinhaugh and Sandyford; 9, or Monteith Row; 15, or Woodside; and 19, or Kingston; one District—viz., 1, or Exchange, was *at* the standard; and three Districts were *above* the standard—viz., Blythswood; 12, or St. Enoch Square; and 10, or St. Andrew's Square.

Of the 16 Districts having houses *below* the standard house as to size, and *above* the standard of occupancy, *all but six* were *above* the standard of illegitimacy. The exceptions were Districts 5, or Bellgrove and Dennistoun; 21, or Hutcheson Square; 4, or St. Rollox; Springburn and Maryhill; 7, or Greenhead and London Road; and 2, or Port-Dundas.

THE NEW HOUSE ACCOMMODATION OF GLASGOW.

In Part I. of this Report I said :—" If we could ascertain the cubic contents of every dwelling-house or room, we should get to the heart of this element of density in the physical circumstances of the inhabitants of towns :—In the preceding inquiry into the relation of the vital statistics of the Districts of Glasgow to the mean number of persons per room in the houses of each District, I have been endeavouring to work out from this datum the relation of space in the house to the health of the inmates. We have found that in certain Districts the general relation seems to be lost.

In general it is the fact that a District which has houses occupied *above* the standard number of persons per room (*i.e.* above the mean number of the whole city), has a general death-rate *above* the standard death-rate of the city, an infantile death-rate of the city, and especially that the fatality of those diseases which are directly related to overcrowding or deficiency of breathing space—viz., Diseases of the Lungs and Infectious Diseases, is in excess in those Districts. But there are exceptions to this law, and I propose to devote some careful consideration to these exceptions in the hope of proving that they really support the law.

A glance at the exceptional Districts shows that there are 5 which, in all our comparisons of Vital Statistics and mean number of inmates per room, appear among the exceptions to the general law. These are

Springburn and Maryhill.
(4) St. Rollox.
(5) Bellgrove and Dennistoun.
(7) Greenhead and London Road.
(21) Hutcheson Square.

These Districts have one common characteristic—they bare the *growing* working class districts. All but one are circumferential. Comparing their populations in 1871 and 1881, the following are the Districts which had increased, with the percentage of increase :—

(15)	Springburn and Maryhill,[1] - - -	75 per cent.
	Woodside, - - - - - - -	66 "
(7)	Greenhead and London Road, - -	47 "
(21)	Hutcheson Square, - - - - -	41 "
(5)	Bellgrove and Dennistoun, - - -	32 "
(17)	Kelvinhaugh and Sandyford, - -	22 "
(4)	St. Rollox, - - - - - - -	10 "
(9)	Monteith Row, - - - - - -	9 "
(13)	Brownfield, - - - - - - -	3 "
(19)	Kingston, - - - - - - -	3 "

---

[1] This district was extended by the Municipal Extension Act of 1872, but the population added was trifling.

As the Districts were not created until 1871, we cannot ascertain their population in 1861, but as they are all subdivisions of the old 10 Registration Districts which were displaced by the rearrangement in 14 Registration Districts on 1st January, 1875, we can reconstruct the old Registration Districts and compare their population in 1861 and 1881 as follows:—

Old Registration District.	Present Statistical District.	Population.		Increase or Decrease.	
		1861.	1881.	Amount.	Percentage.
1. Central - -	(1) Exchange, (2) Port-Dundas, (3) High Street and Closes (W.), (4) St. Rollox, -	49,678	49,631	-47	...
2. High Church,	(5) Bellgrove and Dennistoun, (6) High Street & Closes (E.),	48,119	61,940	+13,821	+29
3. Bridgeton, -	(7) Greenhead & London Rd. (8) Barrowfield, -	45,485	73,602	+28,117	+62
4. Calton, - -	(9) Monteith Row, - - (10) St. Andrew's Square, - (11) Calton proper,	36,625	31,159	-5,466	-15
5. Clyde, - -	(12) St. Enoch Square, - (13) Brownfield, - (14) Bridgegate & Wynds, -	29,975	15,284	-14,691	-49
6. Blythswood, -	Blythswood, -	28,697	26,789	-1,908	-7
7. Milton, - -	(15) Woodside, (19) Cowcaddens, -	33,360	60,313	+26,953	+81
8. Anderston, -	(17) Kelvinhaugh and Sandyford, - - (18) Anderston proper,	40,945	55,659	+14,714	+36
9. Tradeston, -	(19) Kingston, - (20) Laurieston, -	38,600	47,066	+8,466	+22
10. Hutchesontown, -	(21) Hutcheson Square, - (22) Gorbals, -	44,019	67,860	+23,841	+54
Total,	- - - -	395,503	489,303	+93,800	+24

"Springburn and Maryhill" was not included in the old 10 Registration Districts, so that we cannot state its growth between 1861 and 1881, but we have only to look at a map of Glasgow for 1861 to convince ourselves that it is practically the product of the last 20 years. Indeed, as already stated, it is a statistical fact that the population of this District has increased 75 per cent. in the last 10 years. The old Registration Districts were, as a rule, decided so as to constitute the old and stagnant or retrograding part into a distinct District from the growing part, so that when we find *High Church* credited with a growth of 29 per cent. in 20 years, and observe that it is divided into Bellgrove and Dennistoun, and High Street and Closes (E.), we know that this growth was wholly in the former, and that this 29 per cent. increase is only the balance left after deducting the depopulation of the latter. Similarly, *Bridgeton* added 62 per cent. to its population in 20 years, but we observe that it is divided into Greenhead and London Road and Barrowfield, and we know that this growth was almost wholly in the former. *Milton* added 81 per cent. in 20 years, but we are sure that this enormous development was concentrated in Woodside because Cowcaddens has been stagnant. *Anderston* gained 36 per cent. in 20 years, but this growth has been in Kelvinhaugh and Sandyford, and has been partially neutralized by depopulation in Anderston proper. *Tradeston* gained 22 per cent. in 20 years, but Laurieston, we know, has been retrograding, so that more than all this increase belongs to Kingston. The small growth of Kingston during the last 10 years (only 3 per cent.) shows that the extension was chiefly the work of the previous decade. In fact, it grew towards the western boundary, which was soon crossed, and Kinning Park Burgh represents the more recent development of the district. *Hutchesontown* added 54 per cent. in 20 years, but this is merely the balance of the depopulation of Gorbals and the growth of Hutcheson Square, which we may safely conclude has doubled its population.

We obtain some conception of the size and social composition of this New Glasgow from a statement which I have compiled, from materials furnished by the Master of Works, of the number of dwelling-houses, classified according to size, for the erection of which authority was granted by the Dean of Guild Court in each year since 1866. That is the date of the present Police Act, under the building regulations of which this New Glasgow has been erected. . . . The following is a summary of the facts for the 15 years, 1866-80 :—

Size of House.	No. of Houses.	Population.
1 Apartment,	10,439	32,361
2 Apartments,	22,960	112,504
3 Do.,	8,671	45,956
4 Do.,	2,383	12,630
5 Do.,	1,183	9,227
Total,	45,636	212,678

The population inhabiting these new houses is estimated from the average number of inmates per house of each size found at the census, as given in Table V. Appendix to Part I of this Report. What does this statement show? That in the 15 years 1866-80, we built, under the improved conditions imposed by the Glasgow Police Act, a city of 212,700 inhabitants, of whom 15 per cent. occupy houses of 1 apartment: 53 per cent. houses of 2 apartments; 21½ per cent. houses of 3 apartments; 6 per cent. houses of 4 apartments; and 4½ per cent. houses of 5 apartments and upwards. This is 42 per cent. of the whole population in 1881.

AIR-SPACE OF A "ROOM" IN NEW AND IN OLD GLASGOW.

We have taken the number of persons per room as the best available representation of the comparative position of the inhabitants of the Districts as to air space. But it is evident that a "room" in a tenement built within the last 10 or 20 years must represent conditions of space very much better than a "room" in a tenement in "Bridgegate and Wynds," or in "Gorbals" or in "Laurieston." *Externally*, we have fronting the modern tenement, comparatively broad, well aerated streets, and houses generally occupied as originally designed, and opening directly on the common stair; while in the old tenements we have back lands, narrow streets and alleys, and, above all, "made-down houses"—*i.e.* houses occupied as one, two, or three apartment dwellings, which were originally the kitchen, parlour, and bed-rooms of large houses, access to which is obtained by long, ill-ventilated L and T lobbies. *Internally* we have in the modern tenements, loftier ceilings, and more liberal dimensions generally, giving more cubic space per room than in the old tenements.

This is a matter of too much interest and importance to be trusted to generalities. I have therefore obtained some measurements of the dimensions of small houses of old and of modern construction, which I have classified as follows:—

1. CUBIC CONTENTS OF OLDEST HOUSES, MOSTLY 'TICKETED.'

Size of House.	No. of Houses.	Mean Cubic Space per House.	Mean Cubic Space per Room.
1 Apartment,	646	1,163	1,163
2 Apartments,	327	1,860	930
3 Do.,	18	2,780	927

There are 991 houses in this group, of which 426 are in High Street, Saltmarket, Bridgegate, King Street, Stockwell and vicinity, the remainder in the oldest portions of the other districts of the city.

2. CUBIC CONTENTS OF MORE RECENT, BUT STILL OLD HOUSES IN TRADESTON.

Size of House.	No. of Houses.	Mean Cubic Space per House.	Mean Cubic Space per Room.
1 Apartment,	100	1,007	1,007
2 Apartments,	104	2,077	1,038
3 Do.,	110	3,656	1,219

There are 314 houses in this group, all in Tradeston, which was feued by the Trades' House at the end of last century.

3. CUBIC CONTENTS OF NEW HOUSES IN DISTRICT 15, OR WOODSIDE.

Size of House.	No. of Houses.	Mean Cubic Space per House.	Mean Cubic Space per Room.
1 Apartment,	100	1,268	1,268
2 Apartments,	100	2,498	1,249
3 Do.,	23	3,722	1,240

These 223 houses are nearly all in recently built tenements in Hopehill Road, and fairly represent the ordinary run of artizans' dwellings erected by private enterprise under the usual conditions of the Glasgow Police Act, 1866.

4. CUBIC CONTENTS OF NEW HOUSES—OATLANDS AND OVERNEWTON.

Size of House.	No. of Houses.	Mean Cubic Space per House.	Mean Cubic Space per Room.
1 Apartment,	116	1,344	1,344
2 Apartments,	137	2,637	1,318
3 Do.,	101	3,999	1,333

These 354 houses are all situated on the lands of Oatlands and Overnewton, which were purchased by the Improvement Trust, and feued in accordance with a plan carefully laid out by the Master of Works, reserving in each case a central square as breathing space. They represent the best class of modern artizans' dwellings in the city.

The general effect of these measurements is to establish our contention that the unit "room" represents increased internal air space in tenements of recent construction as compared with those of old date. Of 1 apartment houses the mean air space is, in old houses, 1163 cubic feet, in the Tradeston houses 1007, in ordinary builders' tenements 1268, and in the Improvement Trust feus 1344 cubic feet. It is only in the case of one apartment houses that the old tenements have any advantage. They are larger than in the tenements of Tradeston. These commodious single rooms are almost entirely confined to the Central District, and are found in the old houses of the early Glasgow gentry. Some of them contain over 2000 cubic feet. Still this *internal* air space is deprived of its utility by the deficiency of the *external* air space, and the fact that they are occupied by the lowest classes in the community, among whom overcrowding is only kept down to the legal limit of 300 cubic feet per adult by constant night visitation and prosecution. In 2 apartment houses the increase of air space per room is unbroken. Of the old houses the mean air space per room was only 930 cubic feet, of the Tradeston houses 1038, in ordinary modern builders' tenements, 1249, and in the Improvement Trust feus 1318. In 3 apartment houses the same progressive increase is evident. Of the old houses, the mean air space per room was only 927 cubic feet, of the Tradeston houses 1219 in the ordinary builders' tenements 1240, and in the Improvement Trust feus 1333. If we calculate the mean air space of all those houses of 1, 2, or 3 apartments in the four groups, we find that in the old houses it was 1007 feet per room, in the Tradeston houses 1088, in the ordinary builders' houses 1252, and in the Improvement Trust feus 1322.

HEIGHT OF CEILING OF "ROOM" OF OLD AND NEW GLASGOW.

I have classified the houses in these groups above according to the height of the ceiling, with interesting results, which are collected into the following Table :—

Height of Ceiling.	No. of Houses in each Group.				Percentage at each height.			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
6 ft. and under 7 ft.,	64	2	...	...	6·4	0·6	...	...
7 " " 8 "	277	47	1	...	28·0	15·0	0·5	...
8 " " 9 "	356	117	27	...	36·0	37·0	12·0	...
9 " " 10 "	232	90	133	133	23·4	29·0	59·6	37·5
10 " upwards,	62	58	62	221	6·2	18·4	28·0	62·5
Total, -	991	314	223	354				

These figures prove that there has been a progressive increase in the height of ceiling of artizans' dwelling. In the oldest houses we find above 6 per cent. with ceilings 10 feet and upwards, because even in those ancient times the gentry realised the advantages of lofty ceilings, and 10 to 11 feet was their limit, just as 12 to 14 feet is the choice of the West-End successors. But in those times a large proportion of the working class tenements had ceilings as low as 6 feet and under 7 feet or 7 feet and under 8 feet. These figures gradually disappear as we come to modern tenements, until the old genteel limits have become the rule in the modern artizans' dwellings of Glasgow. In the ordinary builders' tenements scarcely any houses have ceilings below 8 feet, nearly 60 per cent. are 9 feet and under 10 feet, and 28 per cent. 10 feet and upwards, while in the Improvement Trust feus there are no ceilings below 9 feet, and nearly 63 per cent. have ceilings of 10 feet and upwards in height.

VITAL STATISTICS OF FOUR GROUPS OF DISTRICTS.

On the basis of these facts we may now arrange the 24 Districts of Glasgow into 4 Groups, which represent a gradation of the physical conditions of health, especially as to air space, in and around the dwellings of their inhabitants. In all my periodical reports a similar classification has been adopted, but it must be carefully noted that the present Groups differ slightly in their composition from the former. District 15, or Woodside, which formerly appeared in Group 11, is now transferred to Group I. as being by its modern growth more nearly allied to it. District 16, or Cowcaddens, has been transferred from Group III. to Group IV. Otherwise the Groups have the same component parts. The Districts are, as must be apparent to any careful reader of the detailed description of the social and sanitary conditions of each which has been given in preceding pages, so heterogeneous individually that no method of grouping them is possible so as to bring out in perfection the contrasts of those conditions and their attendant and consequent vital results. For example, no District is purely inhabited by the upper classes, no District is wholly of recent growth, so that its inhabitants can be said to illustrate the vital results of the most modern artizan dwellings. No arrangement of those Districts can be adopted which will show the best or the worst possible results upon health, which may be expected from any set of physical circumstances which in the main they may illustrate.

Still having given this warning, the fact remains that we shall be able to amply illustrate the law that the comparative healthiness of sections of population, whether they be territorially separated and known by name as distinct communities, or are merely artificial divisions of the same community, is determined by the air-space within and without their dwellings. We can classify the inhabitants of one city so as to produce four cities, which, though standing on the same soil and exposed to the same sun and air and general influences of nature, present contrasts in general mortality, liability to certain diseases, and other social and moral particulars capable of statistical expression, which are related to physical differences, especially as to air-space, which seem to be as effective for good and evil as separation by many degrees of latitude and longitude.

DESCRIPTION OF THE FOUR GROUPS OF DISTRICTS.

Group I. comprises the 5 Districts which had the lowest death-rates, and is the nearest approach to a selection of the better classes of the city which we can provide. We cannot give the statistics of the West-End alone, but this group comprises all the West-End, with a large admixture of the middle class and best of our working class population. Still, while Edinburgh has 4.19 rooms per house and 1.32 persons per room, this Group has 3.295 rooms per house and 1.521 persons per room; so that *even this artificially selected Glasgow* does not enjoy the same physical basis of health as the whole city of Edinburgh. Their populations are almost exactly the same, and their death-rates in the three years, 1880-1-2, were 19.2 and 20.5. The five districts are:—Blythswood; (1) Exchange; (9) Monteith Row; (15) Woodside; and Kelvinhaugh and Sandyford.

Group II. contains 6 Districts—viz., Springburn and Maryhill; (4) St. Rollox; (5) Bellgrove and Dennistoun; (7) Greenhead and London Road; (19) Kingston; and (21) Hutcheson Square. This Group includes all the circumferential Districts, excepting the two West-End Districts placed in the preceding Group. *It, therefore, contains the great mass of the recently erected industrial tenements in the city, and may be called the New Glasgow, built under the Police Act of 1866.* Still, this is only true as a general description, because we have in this Group both a small admixture of the better class represented by the villas and large flatted houses of Dennistoun and Greenhead, and several samples, such as Middleton Place, of the poorest class of small houses. In 1871, 35 per cent., and in 1881, 45 per cent. of the whole population of the city lived in this Group of Districts.

Group III. contains 5 Districts—viz. (2) Port-Dundas; (8)

Barrowfield; (12) St. Enoch Square; (18) Anderston Proper; and (20) Laurieston. This Group comprises some of the old village centres, which are now absorbed in Glasgow, and some of the first growth of the city at the end of last and the beginning of the present century. The houses in Tradeston, of which the measurements were given above, are fair samples of the accommodation. Only a small proportion of the houses in this Group are occupied as they were originally designed to be occupied.

Group IV. embraces the remaining 8 Districts—viz. (3) High Street and Closes (W.); (6) High Street and Closes (E.); (10) St. Andrew's Square; (11) Calton Proper; (13) Brownfield; (14) Bridgegate and Wynds; (16) Cowcaddens; and (22) Gorbals. These will be at once recognised as the worst districts of Glasgow, both morally and physically. They comprise almost the entire area of the operations of the Improvement Trust.

THE VITAL STATISTICS OF THE COMMUNITY OF GLASGOW, INCLUDING THE NINE SUBURBAN BURGHS.

A complete presentment of the Vital Statistics of the *whole community of Glasgow* in accordance with correct statistical principles, has never been attempted, and is, indeed, beyond the power of private effort to accomplish. A community is a vital unit, and must be treated as such for all purposes of Vital Statistics. It may be cut up into sections for administrative purposes, but this does not destroy the vital connection of those sections, and to secure the expression of this vital unity for statistical purposes—whether we wish to deal with the community as a whole, or still more, if we wish to deal with its administrative parts—the whole statistics must be massed in one central bureau, and there studied and rearranged. The careful and intricate statistical operations which we have described as necessary for the production of the District Statistics of Glasgow proper, serve well to illustrate what ought to be done for each of the administrative subdivisions of the community known as the nine Suburban Burghs. (1) There are institutions in Glasgow proper in which births and deaths occur which must be referred to the locality in which the person who died, or the mother of the child born, usually resided. If this locality was within Glasgow proper the birth or death is reckoned in that District. If it was within any one of those Burghs or elsewhere, the birth or death is not taken account of in any way. (2) There are institutions outside of Glasgow, especially Barnhill and Govan Combination Poor-Houses, in which births and deaths occur which belong to Glasgow proper, and are distributed therein in their proper Districts. No notice is taken of births and deaths belonging to those Burghs, which occur in these poor-houses, any more than of those which occur in the institutions of Glasgow proper. It so happens that neither of these poor-houses is situated within a Burgh, although all the Burghs except Crosshill are within one or other of the Parishes to which these poor-houses belong. It is obvious, therefore, that the births and deaths actually registered within the Burghs do not accurately represent the vital events of those Burghs. In the case of one important class of diseases—the infectious—the correctness of the death returns of the Burghs is still further vitiated by their local arrangements. In Glasgow proper all the infectious disease treated in hospital is treated in hospitals situated within the bounds of Glasgow proper. The two hospitals provided by the Burghs of Maryhill, Hillhead, Partick, Govan, and Kinning Park, and used by all, are both extra-burghal.[1] Consequently all deaths occurring in these Hospitals are registered outwith the Burghs, and do not appear against them in the Registrar-General's returns, nor are they included in the special Burghal returns. Before the erection of local hospitals the case was still worse for comparative purposes, as all the suburban infectious disease was treated in Glasgow, and all the consequent deaths were placed against Glasgow in the national returns. These facts suffice to prove that we have no accurate knowledge at present of the Vital Statistics of Glasgow *as a community*, or of those sub-divisions of Glasgow which are suburban and are for the purposes of local administration separated from the community. It will also be obvious that so long as this diversity of administration prevails we shall continue to be ignorant of the true local incidence of births, deaths, and disease over the whole community, unless the Registrar-General—who alone has the whole facts in his possession—undertakes to re-arrange those facts, distributing over Glasgow and the suburban Burghs the births and deaths registered in those various Institutions. This is now regularly done by the Registrar-General of England for London and its various administrative sub-divisions.

The Scotch Registrar-General could apply the resources of his office to no more important and useful work than to do the same for Glasgow and its administrative sub-divisions.[2]

---

[1] In 1880-1-2, the Govan Hospital was *within* the Burgh, but a new Hospital has since been erected *outside* the Burgh.

It may be supposed that the system of "Transcripts" ought, so far as births are concerned, to restore to the Districts of Local Authorities the births in Institutions which properly belong to them as the domicile of the mother. But this is not the case. "Transcripts" of births are sent to the Registration

Seeing that it is impossible for me to compile the Vital Statistics of the Community of Glasgow in the full and perfectly accurate way described above, I have thought that the next best thing to do would be to collect from the Registrars and the suburban local authorities the births and deaths in 1880-1-2 *as registered* in each of the suburban Burghs, to mass them with the births and deaths *as registered* in Glasgow proper, and to calculate the respective birth and death-rates of each, and of the whole community on the basis of the population in 1881, adding calculations as to density, house accommodation, and room space on the same basis. We have seen that for Glasgow proper, *taken as a whole*, it makes no serious difference in the general rates of births and deaths, whether we take the births and deaths as registered, or as adjusted by a process of inclusion and exclusion. It is in comparisons that these rates become misleading.

One death more or less in a population of 500,000 makes no difference; but in a population of 5,000 it makes a serious difference. In the case of the Burghs adjustment would certainly add to the death-rate and birth-rate, especially in such Burghs as Maryhill, Partick, Govan, Govanhill, and Kinning Park, which are largely inhabited by the working classes. There is in their case no counterbalancing exclusion. But we must be satisfied with pointing out this defect and take our returns as we can get them.

The aggregated returns will be found in Table XIII. in the Appendix[1] the title of which fully shows its contents—viz., "Table showing population, acreage, and the number of inhabited houses and rooms (Census 1881), with births and deaths in 1880-1-2, of the nine Suburban Burghs, and Glasgow." This Table contains the whole numbers. The following Table contains the calculations based thereon, the Burghs being arranged according to the number of persons per room, beginning with the lowest.

District in which the mother had her domicile, *if the Institution* in which the child was born was not situated within that Registration District. But if we take the case of an Institution which is in the same Registration District as that in which the mother usually resided, but the domicile is in the Burghal, and the Institution in the "Landward" part of the Registration District—*i.e.* beyond the Burgh, then no "Transcript" is entered within the Burgh. Govan Combination Poor House is an illustration. It is situated in the Landward part of Govan Church Registration District, part of which is in the Burgh of Govan; and consequently no "Transcripts" are made within the Burghal portion of the Registration District. The births of children whose mothers usually resided in Govan must be specially selected from the Registrar's books by the officials of the Burgh. This is not done. The Burghs do not avail themselves of "Transcripts" even when the rules under which these are made put this adjustment of births within their reach. But even although they did, special arrangements are required to make their birth returns correct in the sense in which the Glasgow official returns are so.

[1] Not reproduced here.

TABLE SHOWING RELATION OF DEATH-RATE TO HOUSE ACCOMMODATION IN GLASGOW SUBURBAN BURGHS AND GLASGOW, 1880-1-2.

Name of Burgh, etc.	Persons per Room.	Rooms per House.	Density, 1881.	Birth-rate, 1880-1-2.	Death-rate, 1880-1-2.
Pollokshields, -	0·627	11·170	13	16·2	10·1
Hillhead, - -	0·830	6·429	51	22·7	10·5
Crosshill, - -	0·929	5·749	37	27·4	12·1
Pollokshields, E.,	1·071	5·177	50	34·2	13·8
Govanhill, - -	1·711	2·847	86	45·9	17·5
Partick, - -	1·782	2·822	27	42·6	20·2
Maryhill, - -	1·834	3·126	11	40·1	20·1
Govan, - -	2·203	2·231	44	45·9	23·3
Kinning Park, -	2·446	1·973	108	47·7	23·3
Total of Burghs,	1·720	2·953	32	42·2	20·4
Glasgow, - -	2·054	2·346	84	37·6	25·6
Burghs & Glasgow,	1·977	2·462	63	38·6	24·6

N.B.—As more fully explained in the text, the numbers of persons per room and of rooms per house are in this table calculated inclusive of Institutions. The Glasgow data differ from the "Whole City" data in previous tables in this part of Report. They are the same as those opposite "Glasgow" in Table III., Part I., p. 46, and for the same reason—to secure comparability. In like manner, the Glasgow Birth and Death Rates differ from the adjusted rates of the "Whole City," in preceding tables, there being no possibility of similarly adjusting the burghal rates as subdivisions of one community.

The Census population of the Burghs was 127,000, that of Glasgow proper 511,415, so that the whole community numbered 638,415, living on an area of 10,078 acres. The mean number of persons per room was in the Burghs 1.720, in Glasgow proper 2.054, in the whole community 1.977. The mean number of rooms per house was in the Burghs 2.953, in Glasgow proper 2.346, in the whole community 2.462. In the same order the density was 32, 84, and 63 persons per acre; the birth-rate 42.2, 37.6, and 38.6 per 1000, and the death-rate 20.4, 25.6, and 24.6 per 1000.

COMPARATIVE AIR-SPACE AND DEATH-RATE IN THE SUBURBAN BURGHS.

In tracing the relation of air space as indicated by the mean number of persons per room in the Districts of Glasgow, we found that the uniformity of the relation was somewhat vitiated by such District variations in the unit-room as these—increase in size of houses of recent construction, better external physical conditions, &c., &c. In the Districts which seemed to be exceptions to the general law, we found that a large proportion of the houses were of recent date. They were growing circumferential districts. In the suburban Burghs we get rid of these elements of incomparability in the cubic space of the rooms and external conditions. They are all of purely modern growth. Their houses are practically all of recent construction. There are also certain minor circumstances which render the mean size of house and mean number of persons per room more closely true as representing the physical conditions of the private dwelling-house in the suburbs, than in the central City or its Districts. The Suburbs are purely residential. They contain no hotels or large boarding-houses, and scarcely any institutions having below 200 inmates, all of which are classed as ordinary houses in the census returns. In the case of Maryhill, the Military Barracks are a vitiating element, the effect of which will be subsequently apparent.

If, then, we compare the number of persons per room in each Burgh with the corresponding death-rate, we find that from Pollokshields, with 0.627 persons per room and a death-rate of 10.1 per 1000, the death-rate advances almost *pari passu* with the number of persons per room to Kinning Park, with a death-rate of 23.3 per 1000 and 2.446 persons per room. Absolutely the only deviation is in the case of Maryhill, which had a death-rate 0.1 lower than Partick, although the number of persons per room was 0.052 higher. The inclusion of the Military Barracks accounts for this exception. *I have no doubt that if the death-rates of these Burghs were adjusted to their proper figures, by the distribution of the deaths in institutions and otherwise, in accordance with sound statistical principles, the relation of the air space per room to those true death-rates would be strictly proportional.* As the returns stand, it is in the working class Burghs, from which institutions derive their inmates in the largest proportion, that this *proportional* relation is lost. It will be observed that the birth-rate also keeps pace with the size of house and mode of occupancy, though not so closely as the death-rate. The *lowest* birth-rate is in Pollokshields, which has the largest houses and the smallest number of occupants per room. The *highest* birth-rate is in Kinning Park, which has the smallest houses and the largest number of occupants per room.

THE STANDARD OF OCCUPANCY AS ILLUSTRATED BY THE SUBURBAN BURGHS.

From the facts of the Glasgow Districts we deduced the following law of occupancy :—" *That the smaller the house the greater the number of inmates per room, or, in other words, the smaller the house the less cubic space per inmates.*" As might be expected from the purely residential character of the Suburban Burghs, this law holds even more closely in them than in the Glasgow Districts. Maryhill is the only exception, which is accounted for by the Military Barracks being included as a " house " or " houses." Otherwise the movement is coincident and unbroken from Pollokshields with a mean size of 11.17 rooms per house and 0.627 persons per room, to Kinning Park, with a mean size of only 1.973 rooms per house and 2.446 persons per room.

Part III.—[The earlier portions of Part III. reviewed the changes in the death-rate for the 15 years ending 1885, but their reproduction here is now unnecessary. All the main features have been embodied in Chapter III.—(Ed.)]

CERTIFICATION OF DEATHS IN GLASGOW.[1]

The determination of the cause of every death occurring in a community is of prime importance for the saving of life.

In detailed Tables [which were appended, but are not here reproduced] the deaths are classified with reference to medical attendance and certification. Under " Certified " are placed all deaths, the cause of which was medically certified; under " Not Certified " are placed the deaths of persons who were said to have had medical attendance, but regarding which no certificate could be obtained from the medical man named, the meaning of which is that he had not seen the person sufficiently recently to feel justified in certifying; under " No Medical Attendance," are placed the deaths of persons regarding whom it was admitted that they had not been seen in their fatal illness by a doctor; under " Dispensary " are placed the deaths of persons who were alleged to have been taken to a Public Dispensary or " Doctor's Shop," but regarding the cause of whose death no medical certificate could be obtained, generally because the prescribing physician could not identify the case. These facts have two aspects—(1) the scientific; (2) the humanitarian or social. As to the scientific aspect, the cause assigned for a death in the public register has no value or validity, unless it is testified by a medical certificate. Therefore, the proportions of the total deaths certified and uncertified are the only data which it is of scientific importance to know. From a humanitarian and social point of view, the other details as to medical attendance, and the character of it as effective treatment of sickness are of interest and importance.

---

[1] See footnote p. 485.

It is satisfactory to observe that the proportion of uncertified deaths is diminishing overhead, and below 5 years of age, as well as above it. In 1880,[1] 10.5 per cent. of the total deaths were uncertified, and this proportion fell continuously in each to below 7 per cent. in 1885. The proportion uncertified *below* 5 years fell in the same way, from 16 per cent. to below 11 per cent.; while above 5 years, it fell from a little below 6 per cent. to below 4 per cent. It will be observed that in 1885, as compared with the preceding year, there has been a slight retrogression.

The humanitarian or social aspect of the certification of deaths in Glasgow is not so satisfactory. Every uncertified death on the register implies blame somewhere, either on the guardians of the deceased, the community, or the State. If from any circumstance whatever the cause of death cannot be certified from observations made during life, then the machinery of the State ought to be such that it will without fail ascertain the cause after death. This *post-mortem* inquiry is of no value to the individual deceased, so far as his life is concerned; but it is of supreme importance to every person who may in the future be exposed to loss of life in the same circumstances. In this aspect every uncertified death, unless death followed upon accident or disease so suddenly as to afford no opportunity for the intervention of medical aid, implies neglect during the last sickness. Whether this neglect lies at the door of the guardian of the deceased; or of the public from want of provision for medical aid to the poor, it is culpable, if not criminal; and the fault or crime will never be brought home either to the natural guardians of the sick or to the public unless by systematic inquiry into every uncertified death. I have only singled out the proportion of the uncertified deaths in which it was frankly admitted that the deceased received no medical attendance whatever. I might safely assert that medical attendance at dispensary, public or private, or otherwise, which fails to enable the attendant to identify the individual and certify distinctly to the nature of the disease which resulted in death, does not satisfy the humanitarian any more than the statistician. But I set aside such cases, and simply point out as a social scandal the number of persons who die in Glasgow without medical attendance, even in this limited sense. It is satisfactory to find that the proportion fell from 5.6 per cent. of the total deaths in 1880 to 3.4 per cent. in 1884. Still, to that extent, the scandal remains, and it becomes all the more grave when we observe that just where life is most helpless and insecure the proportion is greatest, and where life has more selfish interests tending towards its preservation, the proportion is least. The proportion of children under 5 years of age who died without medical attendance ranged from 7.8 per cent. in 1880 to 5.2 per cent. in 1884, while the proportion of persons above 5 years of age who died without medical aid ranged from 3.6 per cent. in 1880 to 1.8 per cent. in 1881. In 1885 it will be observed that this improvement was checked. The proportion both of deaths uncertified and of deaths without medical attendance was slightly greater than in 1884.

---

[1] In recent years the proportion of deaths uncertified has not reached 3 per cent.—[Ed.]

COMPARATIVE CERTIFICATION OF LEGITIMATE AND ILLEGITIMATE CHILDREN.

The sinister aspects of this question of Certification in Glasgow are still further developed, by showing the Comparative Certification of Legitimate and Illegitimate Children in infancy and childhood. (Table omitted.)

I shall not occupy space by writing out in words the eloquent speech of the following facts:—While the cause of death of 20 falling to 14 per cent. of the *Legitimate* children who died before the end of their first year of life was uncertified, the cause of death of 35 falling to 24 per cent. of the *Illegitimate* infants was uncertified. While the cause of death of 10 falling to a little over 5 per cent. of the *Legitimate* children who died between their first and fifth year of life was uncertified, the cause of death of 26 falling to 11 per cent. of the *Illegitimate* children who died at the same age was uncertified.

INSURANCE OF LIVES IN FRIENDLY SOCIETIES, WITH COMPARISON OF INSURANCE OF LEGITIMATE AND ILLEGITIMATE CHILDREN IN GLASGOW—1880-1885.

Prior to 1876 the proportion of Uncertified Deaths in Glasgow was always about 22 per cent., a fact which is scarcely credible concerning the vital statistics of a civilised community. Since then it has steadily fallen, so that, as we have seen, in 1884 it reached the lowest point—viz., below 7 per cent., there being a very slight increase in 1885. This has come about through the "Friendly Societies' Act," which came into force in 1876. By Section 14 of that Act "no society shall pay any sum of money on the death of a member" unless on the production of a certificate of registration; and by Section 28 it is enacted in reference to children under 10 years of age that "no such certificate shall be granted unless the cause of death has been previously entered in the register of deaths on the certificate of a coroner, or of a registered medical practitioner who attended such deceased child during its last illness, or except upon the production of a certificate of the probable cause of death under the hand of a registered medical practitioner, or of other satisfactory evidence of the same."

The immediate effect of these enactments was to improve the certification of deaths, especially among children. There can be no doubt that the progressive increase in the proportion of certified deaths since 1876 is not merely due to the enforcement of the provisions of the "Friendly Societies' Act" in the case of persons already enrolled in Friendly Societies, but also to the gradual extension among the population of the practice of Insurance in such Societies. . . .

There was in 1876 only 36 per cent. of the persons who died in Glasgow enrolled in Friendly Societies, and the proportion has risen year by year, without interruption, until in 1885 there was over 52 per cent. This is gratifying, both scientifically, as securing much more accurate information as to the incidence of disease, and socially, as showing the spread of providence among the population. But my main purpose here is to direct attention to the extent to which the insurance of children prevails, and especially to the growing proportion of illegitimate children who are enrolled in Friendly Societies. Under 1 year the proportion of Legitimate children who died insured has advanced from 21 per cent. in 1876 to 37 per cent. in 1885; and the proportion of Illegitimates from 4 per cent. to 12½ per cent. in 1884. This is an increase of two-thirds in the case of Legitimate children, while that of Illegitimate children is threefold. Between 1 and 5 years the proportion of Legitimate children who died insured has risen from 47 per cent. in 1876 to more than 64 per cent. in 1885, while that of Illegitimates has risen from 22 per cent. to nearly 37 per cent. In the face of these facts, and from a close observation of the working of the Friendly Societies' Act in reference to Registration, I have no hesitation in saying that it requires the attention of the Legislature. In my Report for the quarter ending 31st March, 1878, I made the following observations on this subject, and I reproduce them now, emphasised by the extended experience of subsequent years:—

"A considerable number of the certificates are simply an expression of the opinion of a doctor called in after death to view the body, the doctor being summoned only when the parents find that without a certificate the money cannot be got. There may be cases of death under circumstances which prevent medical attendance being obtained in life, or at any rate may excuse the want of it; but it is undeniable that in the majority of such cases a medical man both assumes a very serious responsibility and shows practical sympathy with persons whose position merits nothing but reprobation and exposure, when from an external examination and on an *ex parte* statement he ventures to certify, *on the form drawn up for the use of a regular medical attendant*, to the cause of death of the deceased, especially if a child. In the case of a child whose death brings a few pounds to its guardian, and who during life receives no medical attention, so that there is a difficulty in reaping the advantages of its death, all our sympathies ought to go with the child; and for the sake of other children no one ought to interfere to remove this difficulty. At the best the conditions of the Friendly Societies' Act interpose but a frail barrier between the cupidity of the beneficiary and the life of the child. The facility with which post-mortem certificates can be obtained goes far to remove this barrier entirely.

" On the other hand, in the civil aspects of the Registration Act a certificate so granted contributes worse than nothing to our knowledge of the cause of death. The question of criminality may be settled by the wide and safe verdict of a 'natural cause,' but in the majority of cases, when a medical man sets himself, without a *sectio cadaveris*, and without a particle of knowledge from personal observation of the symptoms during life, to certify to the precise 'natural cause' which issued in death, he might as well determine his opinion by writing a few names on bits of paper and drawing one out at random. In a case which recently fell under my notice of the death of a child aged 6 months, *without medical attendance*, the cause of death was registered as 'debility,' subsequently altered to '*Tabes mesenterica*' as the opinion of the Registrar, based on the statement of the parents. For certain reasons I reported the death to the Sheriff's Fiscal. To prevent the necessity of a *post-mortem*, the parents referred to one practitioner who was prepared to certify that the cause of death was 'convulsions,' and produced a certificate from another to the effect that the child died from 'acute pneumonia.' The Sheriff, however, issued his warrant for a post-mortem examination, the result of which was to prove that the precise cause of death was 'tubercular meningitis!' ".

CHAPTER X.

ON THE PREVENTION OF TUBERCULOSIS.[1]

INTRODUCTORY.

In December, 1891, the Medico-Chirurgical Society of Glasgow, after a discussion, came to the following resolution: "That a Memorial be presented to the Town Council of Glasgow calling their attention to the fact that tuberculosis is now fully recognised as an infectious disease, and asking them to take the matter into their serious consideration, with a view to the protection of the community from the infection." A Memorial[2] was accordingly drawn up and submitted to the Committee on Health in January, 1892. It was remitted to me for consideration and report.

The signatures appended to this Memorial are sufficient to secure for it respectful consideration. They guarantee that whatever it contains of positive statement as to the nature of tuberculosis is accurate, and that whatever of suggestion it makes as to practical measures is judicious. Still, the attitude of the administrative mind towards the contributions of science to the stock of knowledge and towards their executive application and effect is different. We receive implicitly and with gratitude the results of the laboratory and the study; we apply our own judgment to executive proposals. We are bound to consider their bearing on general policy, and to determine their expediency from a forecast of the advantages and disadvantages likely to follow their adoption. This distinction was clearly present to the minds of the Memorialists. No representation relative to the duties of the Local authority could have been made with greater tact and discretion. It is a distinction which is very well illustrated in the history of the subject of the Memorial. Koch's paper on "The Etiology of

---

[1] A Report issued October, 1895.

[2] See p. 568.

Tuberculosis," published in 1884, contains practically all the scientific facts necessary for the guidance of preventive administration. No essential statement made by Koch has been impugned, and nothing of importance has been added.[1] It is otherwise with the detailed application of his facts. This has been gradually developed by remarkable investigations specially directed to that end; by the discussions of such bodies as the Congress on Tuberculosis, held in Paris in 1888, 1891, and 1893, the French Academy of Medicine in 1889-90; by successive International Hygienic and Medical Congresses, &c.; by specialists engaged in administration, such as the German Public Health Association in 1889, and the Incorporated Society of Medical Officers of Health of England in 1893; by reports on special references made by these bodies to experts; and by numerous State and Municipal Authorities in various parts of the world, who have from time to time actually taken administrative action. There has, therefore, been an obvious advantage in delay. In the enthusiasm naturally inspired by a new discovery, there is always an element of danger. When the issues concern interference with human conduct, and involve the personal liberty of a considerable section of the community, even on the plea of the safety of the remainder, we are bound to ask if the game is worth the candle. The first disciples of a new doctrine must be enthusiasts. The regimen dictated from the laboratory is gradually moderated by the expediency of the administrative bureau. The practical methods of dealing with the infection are now better understood, and have, in consequence, been greatly simplified. Their importance in relation to general hygiene is now seen in more just proportion. I have, in the interval since this Memorial was remitted to me, followed closely all these discussions and investigations, and have collected everything in the shape of reports and documents which serves to show what is the general attitude of the administrative mind to this important subject, more especially in the country to which we owe the knowledge of the facts which we are told call for administrative action.

TUBERCULOSIS IN GENERAL.

WHAT IS TUBERCULOSIS?

The word tuberculosis, or tuberculous disease, is associated in the popular mind almost exclusively with Phthisis or Consumption of the Lungs. This is by far the most frequent and most deadly form of tuberculosis; but every organ and every tissue of the body may be the seat of tuberculous disease. Hydrocephalus is tubercle in the membranes of the brain; Tabes Mesenterica is tubercle in the lymphatic glands of the abdomen; Scrofula, in the popular sense, is tubercle in the superficial lymphatic glands, most familiar in the neck; Lupus is tubercle in the skin; there is tubercle of the joints and of the bones, giving rise to suppurations in all sorts of places, and occasioning surgical operations almost as various in their nature as in their locality.

---

[1] It is not meant that everything relative to the infectivity of tuberculosis in Koch's "Etiology" is new. Cohnheim, in his pamphlet, "Tuberculosis as an Infectious Disease" (1880), reasons out with as much clearness as was possible before the actual discovery of the infecting bacillus (Koch, 1882) many facts as to infection and its methods, especially inside the body. He first popularized the idea of infection as regards tuberculosis.

Tuberculosis is a disease, not only of man, but of the lower animals. No warm-blooded animals are insusceptible when artificially tested, but it occurs naturally with great frequency in those which are domesticated or confined, as the cow, the pig, the rabbit, in fowls, in monkeys, &c.

The only cause of tuberculosis is the tubercle-bacillus. Without the bacillus there can be no tuberculous disease. Therefore, to prevent tuberculosis, we must stamp out the bacillus. From our point of view, tuberculosis is a disease. From the point of view of the bacillus, it is a natural life-process. The bacillus has a plan of life laid down for it, providing, as usual, for the maintenance of the individual and the propagation of its kind. Clearly, it is necessary that we should understand this plan before we can hope to disconcert it. The prevention of tuberculosis rests upon the biology of the bacillus.

The Biology of the Bacillus.

The bacillus is not inherited. As regards Pulmonary Consumption, this statement may be taken as absolutely true. The bacillus *may* pass from a tuberculous parent into the body of the fœtus, and be born with it; and thus the offspring may carry into independent life a tuberculous process, but this fact has merely an academic interest. Tuberculosis has been actually seen in the fœtus with just sufficient frequency and certainty to prove that the inheritance of the bacillus is not impossible. For all practical purposes, the hygienic administrator is bound to regard *every* case of tuberculosis as caused by infection which has taken place so to speak in the open—within the sphere of his control.

The tubercle-bacillus not being inherited, but passing into the body from the outside, how does it get there? Under what conditions does it exist there? Under what conditions does it pass from the outside to the inside of the body? Under what conditions does it live and propagate there? It is impossible to demarcate the answers to these questions as clearly as the questions themselves. In nature the facts are interlaced, but, at any rate, the questions so stated will promote clear thinking.

The bacillus multiplies by subdivision and by the production of spores. As compared with other disease-producing organisms, it grows very slowly even under the most favourable circumstances. To be effective, therefore, these circumstances must be maintained for weeks continuously. At a temperature of 86 deg. F. growth is much enfeebled, and it entirely ceases below 82.4 deg. F. It cannot grow at a temperature above 107.6 deg. F. It flourishes at the natural deep temperature of the human body, viz. 99 deg. to 100 deg. F.[1] Moisture is absolutely essential to growth, with a limited supply of air and an absence of light. Obviously, we have here an aggregate of conditions which, in this country at any rate, can only be found in nature *inside the animal body*. The tubercle-bacillus cannot multiply outside the animal body; it can merely live, and live only under certain conditions, and under any conditions only for a limited time.[2]

When the bacillus obtains access to the body of a warm-blooded animal, which it almost solely does by the great main entrance, the mouth, passing thence into one or other of the diverging channels, the windpipe and the gullet, it is not yet in a physiological sense inside the body. It must break through the mucous surface of these passages. This is a most important stage in the career of the bacillus from a preventive aspect, which must be dealt with at large further on. Meanwhile, let us assume that the bacillus has broken through, still it has enemies in the tissues and fluids of the body. These also have a supreme interest for us, but these also we shall meanwhile pass by. If every circumstance has proved favourable, the bacillus proceeds slowly to multiply, and in doing so to invade and break down the natural tissue around. It may be borne along the stream of lymph or blood, or be carried by wandering cells to other parts of the body. However it may be effected, in all movement the bacillus is passive. Wherever it establishes tuberculosis, the process has products—irritated and disorganised tissue, pus, &c. These products have the relation of foreign bodies to the healthy tissues, and have therefore an eccentric or centrifugal bias. They may, however, be imprisoned and retained, sometimes changed in nature. If the process lies on the line of the great channels by which the bacillus gained entrance, then it has an equally patent exit —in consumption, by the expectoration, or by the fæces, if the expectoration is swallowed. If the process is in the bowel or the kidney, or any organ having a natural exit for its products, then the morbid matter passes out thus. If the process is in bone or in lymphatic glands, or in any locality from which the nearest way outwards is through the skin, then we may have abscesses and a discharge of matter therefrom. To us this is a feature of disease. To the bacillus it is a phase in the cycle of its life. These discharges carry out bacilli and their spores; and these bacilli and their spores maintain the stock of infecting material outside the animal body upon which the continuance of the tubercle-bacillus as an individual and of tuberculosis as a disease depends.

---

[1] The tubercle-bacillus of fowls has a somewhat wider range of temperature.

[2] The bacteriologist produces those conditions artificially, and finds it a very difficult task.

What are the conditions which favour the continued vitality of the bacillus, and preserve the potential activity of its spores outside the animal body?[1] Although the bacillus will not grow, excepting under the conditions of heat and moisture described, it is not killed either by natural cold or heat, or by drying. It is, indeed, one of the hardiest of all disease-producing germs. Freezing has no effect. It resists putrefaction for weeks, and endures in the dry state for months. The greater stability in resisting natural agents and conditions to which other germs speedily succumb is, no doubt, compensatory for the characteristics of parasitism and slow growth. If the bacillus, being unable to grow anywhere but inside a warm-blooded animal, were also unable to survive outside, it would be exterminated. On the other hand, from the animal's point of view, the extremely sluggish growth of the bacillus, and its inability to grow outside, in a measure countervails its tenacity of life, otherwise the animal would be exterminated. Still, in spite of this tenacity of life, the combination of hostile conditions outside the animal body ultimately proves fatal to the bacillus. Direct sunlight will kill the bacillus in a few minutes, and ordinary daylight in a few days, whether it be exposed naked in cultures, or in sputum or in dust, and in each case free flowing air makes the light more active. The converse of these conditions—darkness and stagnant air—favour the bacillus.

TUBERCULOSIS IN MAN.

Hitherto we have dealt with tuberculosis in its general sense, without reference to the species of the animal in which it is found, or the locality of the body where it is seated. In harmony with the general law of life, the bacillus is varied by the soil in which it grows, and the disease to which it gives rise derives characteristics both as to locality and nature from the physiological idiosyncrasies of the species. For these reasons, and since it is in man that we are *directly* interested, we shall now consider specially *tuberculosis in man.*

---

[1] It is impossible to speak separately of the bacilli and their spores. Observations and experiments really refer to the loss or the retention of the property of infectivity.

Putting aside, as of no practical importance, the very rare case of inheritance of the bacillus, man, like other animals, suffers from tuberculosis only when he receives the bacillus from without. Putting also aside, as of no great practical importance from a sanitary aspect, cases which arise from direct inoculation by wounds or through scratches and other ruptures of the integrity of the skin, it may be said that the bacillus always enters by the mouth, that it is either inhaled or swallowed, that it is conveyed either in the air or the food, that it enters either by the lungs or the alimentary canal, or stops short in the structures in and adjacent to the mouth.

Every bacillus and spore thus inhaled or swallowed must have been produced in an animal, not merely derived from or descended from a bacillus or spore produced in an animal, but must itself have passed out from a diseased animal or been included in the flesh derived from a diseased animal.

Tuberculosis in man is therefore caused by infection either (1) through the excretions or discharges from infected animals, including man himself, or (2) the milk of infected animals, including his own species, or (3) the flesh of infected animals.

INFECTION BY SPUTUM AND OTHER DISCHARGES.

There is a remarkable consensus of opinion that persons suffering from Phthisis or Consumption of the Lungs are the largest contributors to the stock of what the Memorialists very aptly call the " floating infection " which exists in the environs of men. Physicians, bacteriologists, and pathologists, each reasoning on the line of the facts best known to them, concentrate upon this opinion. The hygienist sees no reason to dispute it. Nearly three-fourths of the deaths ascribed to tuberculosis are caused by Consumption.[1] Though the bacillus may reach the lungs by other paths than by the air, still the infection which establishes tuberculosis in the lungs and air passages is generally air-borne. Phthisis is the most frequent cause of Phthisis. It is a sufficient cause. Phthisical persons are to be found in every place and in every condition and position in which healthy persons are to be found. Everywhere, therefore, tubercle-bacilli may be distributed. For this reason, while all that has been said as to the discharge of bacilli in tuberculosis generally is correct, Phthisis has been regarded by all authorities who have taken special steps for the prevention of tuberculosis as either pre-eminently or alone among all

[1] In Glasgow, 1890-94, exactly 73 per cent.

its forms demanding precautionary measures. It is necessary, therefore, to inquire how exactly the bacillus is discharged and distributed from a case of Phthisis? in what sense Phthisis is and in what sense it is not infectious?—for a knowledge of the latter is of as much importance as of the former. If we understand how Phthisis becomes dangerous, we shall also understand the nature of the risks arising from tuberculosis generally.

Koch, in that section of his work entitled "The Relations of the Tubercle Bacillus to the Etiology of Tuberculosis," by the exercise of that imagination, combined with close reasoning, which enables the man of science to follow his discoveries to the verge of their consequences, describes the whole phenomena of infection in Phthisis. His conclusions have been very ably established upon a firm basis of experiment by Dr. George Cornet,[1] whose paper is a remarkable example of lucid experimental reasoning, and has been everywhere, with or without acknowledgment, followed in the instructions for popular distribution issued by health authorities, and in their general preventive measures. Professor Heller's report upon the whole subject and recommendations, endorsed by the German Public Health Association, has been followed by the administration of Berlin.[2]

The tubercle bacillus is not "ubiquitous." It haunts the vicinity of the consumptive. It is not in the expired air. It is not in the cutaneous exhalations. It abounds in the sputum. It abounds in the dust of the apartment. It is a well-known physical law that fluid or moist surfaces will not part with solid particles by evaporation or to a current of air. Hence the absence of bacilli in the expired air, and hence they are likewise imprisoned in the sputum. Even particles of sputum sprayed into the air by the violence of coughing, being gross, subside at once, and could only infect if coughed into the face of some one, and mixed with the actually in-going air. In order to be air-borne, the sputum must be dried and broken up into dust. If discharged into a handkerchief, it speedily dries, especially if it is put into the pocket or beneath the pillow. In the last stages of consumption the patient becomes weak, the sputum is expelled imperfectly, pillows, sheets, handkerchiefs are soiled. If a male, the beard or moustache is smeared. Even in the hands of the cleanly, without special precautions, such circumstances all tend to the production around the patient of a halo of infected dust maintained by every process of bedmaking, or of cleaning which includes the pernicious process happily described as "dusting." In the hands of the careless and the dirty, the infectivity is, of course, greatly aggravated. It attains its maximum of intensity where the filthy habit of spitting on the floor prevails, especially if it is carpeted.

---

[1] Two papers published in the *Zeitschrift für Hygiene*, November, 1888, and April, 1889, and issued, with additions, under the title, "Ueber Tuberculose—die Verbreitung der Tuberkel-bacillen ausserhalb des Körpers, &c.," 1890. Cornet's experiments constitute his entire claim to merit. His master, Koch, had outlined his whole doctrine, and even the details of his prophylaxis are anticipated in a singularly lucid and practical paper by Dr. Richard, "De la Transmission de la Tuberculose par les objet de literie, tapis, tentures, &c."—*Revue d'Hygiene*, 1886, p. 305.

[2] *Deutsche Vierteljahrschrift für öffentliche Gesundheitspflege*, 1890.

The remedy is simply to spit into a spittoon containing a little water; and when a handkerchief must be used, to see that it never dries. Immerse it in water, and ultimately boil it. Better still, use a piece of cloth or paper, and burn it at once. Cornet found that where the spittoon was used, and cleanly habits prevailed, there were no bacilli in the dust; where handkerchiefs were used, even though there was no spitting on the floor, there the dust was infective.

This is the golden rule in dealing not only with sputum but with *all* forms of tuberculous discharge, with the fæces when they are infected, the pus from tuberculous sores and abscesses, &c. *Keep them moist.* Especially do not allow any soiled linen or dressings to lie about and dry. Make it impossible for the discharges to pass into the condition of dust.

It is not merely the dried substance of the discharge which determines the bulk of the danger. All dust must be regarded as suspicious in the neighbourhood of consumptives. If there is any infection at all about, it is there. The ordinary constituents of dust—the fibres of linen and cotton, the shreds of wool—all act as rafts on which the infective germs are borne about, and with which they rise when disturbed.

The infected dust in apartments occupied or frequented without precautions by consumptives will subside indiscriminately upon any exposed surface, and may thus ultimately be swallowed, *e.g.* upon plates, cups, glasses, basins, &c., viands of all kinds and fluids, such as milk or water. The latter are the most dangerous. They present more or less moist surfaces. No dust which falls on them can be blown away again, nor can they be cleaned.

The first person to suffer from carelessness with reference to sputum is the patient. He breathes an infected atmosphere, and in the struggle which is going on between his tissues and the bacillus, the latter is constantly reinforced, fresh territory is invaded, and the chance of recovery is destroyed. Auto-infection is one of the unavoidable risks of Phthisis. The chances of this occurring ought not to be knowingly increased. The use or misuse of handkerchiefs, and swallowing the sputum, are both likely occasions. These facts bring the precautions necessary in the public interest within the scope of the duties of the private physician in the treatment of a case of Phthisis.

Infection by Milk and Flesh.

The other sources from which man may derive the infecting bacillus are the milk and the flesh of diseased animals. That infection through the stomach is possible, we know from the observed effect upon consumptives of swallowing their sputum, and from experiments with animals. The process of cooking tends to diminish the risk; but in the case of milk, there is no such safeguard interposed, owing to the habit of the country to consume it raw. The primary seat of tuberculosis in children is so frequently in the bowels and their related glands, and milk forms so large and essential an element in the food of children, that we cannot avoid the conclusion that it is to them a frequent source of infection. Indeed, no less an authority than Dr. Sims Woodhead has recently very forcibly protested against the tendency to lose sight of infection by food, and especially milk, in the prominence given to infection through the lungs. He points out not merely the frequency of primary abdominal infection, but the occurrence of pulmonary infection, which is secondary to and derived from an abdominal infection, or which may even be coincident with that infection. In children, more especially, even pulmonary Phthisis does not necessarily mean inhaled infection.[1] In the recent report of the Royal Commission "On the Effect of Food derived from Tuberculous Animals on Human Health," we are told that, when the udder of the cow is infected, "the milk possesses a virulence which can only be described as extraordinary"; that "the spread of tubercle in the udder goes on with most alarming rapidity," so much so, that in the intervals of a fortnightly inspection it may develop; that when occasion has arisen to slaughter all the milch cows in town dairies, under the Contagious Diseases (Animals) Act, 40 per cent. have been found to be tuberculous, and that the statistics of slaughter-houses show that a very large percentage of all cows sent there are tuberculous.[2] There is ample room for public interference to prevent the spread of tuberculosis by meat and milk, but, above all, by milk.

---

[1] "Channels of Infection in Tuberculosis."—*Lancet*, 27th October, 1894.

[2] In *The Veterinarian* for August, 1895, it is stated that in a herd of 95 dairy cows tested with tuberculin, 71 were found to be tuberculous. They were sent to market and sold!

THE CONDITIONS WHICH CONTROL INFECTION.

Although without the bacillus there can be no tuberculosis, we cannot call it the sole cause of the infection in the individual case. The theory of infection has a profound influence upon the practical aspects of prevention. So long as we believe that infection is guided from person to person by supernatural agency, without regard to physical laws, we can do nothing. When we advance to the conception that the infecting element is material, and subject to physical laws, we have taken a great stride towards precision, both in preventing and curing the disease. As we ascertain that the element is solid, then that it is organic, we become more precise, until with the knowledge that infection passes with the body of a microbe, a minute living being, we are ushered into the study of those complicated conditions which surround the maintenance and development of life.

We have already learned something of the restrictions imposed upon the tubercle-bacillus by some of those conditions. It can grow only within warm-blooded animals. It retains *vitality* with considerable tenacity outside the body, especially when dried, but sunlight, free air, and other natural agents, which first kill and then disintegrate, wage steady war against it. In the long run, therefore, only a fraction of the total quantity of infecting material survives until it has the opportunity to infect.

When at last the bacillus reaches its natural habitat, disease is not necessarily caused thereby. In other words, but a small proportion of all who are exposed to infection, who actually inhale or swallow the bacillus, are infected. Every breath we inhale is loaded with particles of all kinds, organic and inorganic, dead or possessing the potency of life. A large proportion of this microscopic dust is caught in the nasal passages in the case of nose-breathers. Tubercle-bacilli have been found in the discharge from the noses of the attendants in wards occupied by consumptives. The moist lining of the air-passages catches the dust which passes the nose. The breath we exhale is optically pure. There are arrangements for expelling such particles—for scavenging the air-passages. If there were not, our windpipes would get choked as surely as unswept chimneys. What may be called local health is more important as a protection from the tubercle-bacillus than any other of the species of disease-germs, especially the integrity and vigour of the organs by which it enters the body. The bacillus is slow to develop, therefore there is a longer interval for its expulsion; but any catarrh, however local, anything which interposes a mechanical obstruction, or weakens the expelling power, or hampers the movements of the lungs, or provides crevices as resting-places, interferes with the expulsion of the bacillus, as of every other sort of foreign matter. In like manner, any impairment of the functions or integrity of the stomach or bowels favours infection; but inasmuch as the business of the stomach is to resolve and break up, and its acid juice is inimical, while in the bowels there are swarms of competing microbes, and the struggle for life is keen, the bacillus is more likely to perish in these regions. Still, anything of the nature of indigestion or local irritation may give the microbe a chance.

These are all obstacles to entrance within the substance of the tissues, for, as has already been said, the tubercle-bacillus is no more inside the body after it has passed the portal of the mouth than when it is floating in the dust of the air or in the milk of a tuberculous cow. It is nearer, but *there has been no infection*. When it has effected a lodgment in the tissues, the production of disease depends upon the defeat of the antagonistic forces which surround it. These amount to nothing more than constitutional vigour—tissue-health. A condition of perfect health is one of insusceptibility. In this condition the juices of the tissues are poisonous to microbic life, and their cells active agents of destruction. Depression of vital resistance by disease, debauchery, fatigue, want, even by mental causes, induces susceptibility. Susceptibility may be constitutional, and may be so great and so marked as to amount to a predisposition. This it is which passes by inheritance, and, until the discovery of the bacillus, was regarded as hereditary tuberculosis. It is not the disease which is inherited. It is the pre-disposition—the feeble constitution, the low vitality, the *tout ensemble* of conditions, some of which are recondite and imperfectly understood, some obvious and capable of specification and comprehension. The outcome is a soil so congenial as to accept a delicate infection, from which the majority of mankind emerges absolutely scatheless; a soil which sustains and propagates the bacillus so vigorously that to popular observation the disease seems to be inherited. In such a person a blow or a sprain, a cold or sore throat, determines the local incidence. Nothing shows the reality of the antagonistic forces with which healthy animal tissues are endowed more strikingly than the numerous recoveries which take place, especially from pulmonary infection. In such cases there has been some temporary local susceptibility; but the vital forces have rallied, have invested the detachments of invaders, have cut off their convoys and scouts, and ultimately starved them out. The fact is undoubted. There is nothing in the world to accomplish this result but the native forces of the tissues. The phrase sounds rather mystical and metaphorical; but the forces are real, and may very confidently be trusted as most important allies in any general campaign against tuberculosis.

In such a contest as that which we have depicted, and alike in both stages, the number of bacilli engaged must obviously have an important relation to the result. It is impossible to express oneself without appealing to the analogies of warfare. In the stage of endeavour to obtain a footing, numbers must tell as effectively as in storming a breach; in the stage of maintaining a footing, as effectively as in the resistance of a garrison or the progress of an invasion. This introduces the all-important preventive doctrine of dilution. Infection is fifty times more likely to occur if there are fifty bacilli in each breath of air or pint of milk than if there is but one. Disease is ten times more likely to occur if the tissues are successfully invaded by ten bacilli at once than if by only one. Apart, therefore, altogether from the wholesomeness of ventilation and the vital energy imparted thereby, the merely mechanical effect of diluting or reducing the concentration of infective germs in air has an important protective and preventive power.

So much for infection in the light of the habits of the bacillus, but what we see is a diseased person—a case of consumption, for example. What has been the result of clinical observation as to the evidence of infection? A disease may be so obviously infectious that no one doubts it. No specific organism may ever have been discovered, yet the universal testimony may concur, as, for example, in the case of Typhus. In Southern Europe, Consumption has always been regarded as infectious. In the Western Highlands a similar belief prevails, but it does not extend to ordinary social intercourse. Sleeping in the same bed or wearing the clothes of consumptives are avoided.[1] Detached observations of what were regarded as actual instances of infection have been recorded, but their very paucity is an evidence that, if there be infection, it must be effective under very special and extraordinary conditions. Yet it is astonishing how seldom one finds any satisfactory account of the conditions which predominate over all others—the hygienic. One records a case of marital infection, another a case of marital non-infection. We wish to know (1) whether the parties slept in the same bed, or in same room, or entirely apart; (2) whether they slept in a "box-bed," whether the bedroom measured 10 ft. by 10 ft. by 8 ft. or 20 ft. by 20 ft. by 12 ft., or what; (3) about its insolation and its ventilation. We may have a positive statement on the first point, but not always. As to the other and similar hygienic factors, rarely is a word said; and if there is, it is a mere general impression or vague allusion. Perhaps the most systematic attempt ever made to collect clinical evidence of infection from Phthisis was that of the Collective Investigation Committee of the British Medical Association in 1883. Circulars were issued to the profession. Only 1078 replies were received, and of these 673 contained a simple negative, and only 261 were affirmative. Unfortunately, the circular issued specifically asked for information about almost everything but the hygienic circumstances. The interest and importance of such an inquiry centre in the conditions surrounding both positive and negative observations. No one doubts that Consumption is communicable—or infectious, if you will—but it is obvious it can only be under very peculiar conditions. The very paucity and uncertainty of the replies to this appeal to the medical profession are an evidence of that. Still, a considerable number of the observers refer to ventilation, and we get such replies as the following:—A practitioner (166) who had noted five cases of apparent infection adds, "In all the above cases the patients lived in small, confined houses, and slept in the 'box-beds' in use in Scotland. During 25 years I have not seen one case of contagion in the airy houses of the well-to-do." Another (168) records case of brother, sister, mother, father dying in this order, but he adds, "Family well-to-do, but they displayed great ignorance of ventilation. Children slept in an attic with an immovable skylight, and no fire-place or other means of ventilation. So morbid was the fear of draughts that the windows were hardly ever opened, and the atmosphere inside the whole house was most oppressive and stifling." We note such remarks as these in other cases—(169) "There was, no doubt, overcrowding in this house"; (172) "A. W. slept with his brother in a concealed bed in a badly-ventilated room for several months after his brother took ill"; (176) "in two other cases the houses were very badly ventilated"; (193) "living in same ill-ventilated room"; (194) "the house, consisting of two rooms and an attic, and lying under the brow of a hill on its northern aspect, was ill ventilated and worse lighted"; (201) "her daughter who slept in the same close, badly-ventilated room." An army surgeon gives the following sagacious answer:—(304) "I have no recollection of any particular case caught by contagion at present. Phthisical diseases have, during the course of my service as military surgeon, much diminished in barracks at home since increased cubic space, ventilation, and light were given to barrack rooms." In the great majority of the cases of apparent infection quoted, the parties were either husband and wife,[1] or in relationship so far similar as to occupy the same bed or room. In the occurrence of consecutive illness, even in such highly-favourable circumstances, the determining influence of conditions is apparent. On the one hand, many practitioners state that they have never seen marital infection; on the other, among the cases quoted by those who have, although, as we have already said, no special remarks had been asked on that head, we get such glimpses of the hygienic conditions as these—(6) "The bedroom was small, low, and miserable, about 12 ft. by 8"; (9) "their rooms were very close and warm"; (33) "the room in which they lived was badly ventilated"; (41) "it is only right to mention that the room in which the young couple lived was on the ground floor and damp"; (43) "this is but one instance out of several in which I was much impressed with the apparent communicability of phthisis as from person to person. They were all cases among cottagers where the rooms were small, the ventilation bad, the food scanty, and the soil clay—conditions conducive to the development of phthisis under any circumstances"; (53) "the house they lived in was very small, ill-ventilated, and in a close, poor neighbourhood"; (54) "the wives were exposed to bad hygienic conditions, and took no due precautionary measures, seldom breathing pure air"; (81) "slept in the same bed in a small, unventilated room"; (100) "communicated from husband to wife—latter nursed former almost constantly in small, overheated, badly-ventilated room"; (153) "I have for the last 20 years held that tubercular phthisis is infective as from husband to wife when sleeping together in ill-aired rooms." The conclusion of the Committee which reported upon the whole inquiry was this—"One fact these returns seem to establish beyond any question, and that is, that if phthisis is a communicable disease, it is so only under circumstances and conditions of extremely close personal intimacy, such as persons sharing the same bed or the same room, or shut up together in numbers in close, ill-ventilated apartments."[2] Appended to Dr. Heron's book, "Evidences of the Communicability of Consumption" (1890), are references to 77 papers, &c., chiefly foreign, recording cases of apparent communication of tuberculosis, but the great majority are cases of accidental inoculation with tuberculous material—sputum, pus, crude tubercle, received by cuts or punctures in *post-mortem* dissections, in operations, &c. The interest of such events to local authorities is very slight. No one questions the existence of infectivity in such material, or the possibility of introducing it into the body by cuts or pricks, or by direct application to existing breaches in the skin. To the cases of apparent infection by the lungs, the same remarks apply as to the other series. They nearly all took place under the special condition of sleeping together, and nothing is ever said about the hygienic surroundings. We have no reason to challenge Dr. Heron's summing up—" The whole history of those cases which make up the evidence favouring the view that consumption is a communicable disease goes to show that the essence of the conditions under which infection, not due to inoculation, may take place, is close and prolonged association of a healthy person with a consumptive. There is also good cause for the belief that faulty ventilation is one of the most powerful helpers, if, indeed, it be not the chief helper, in spreading consumption among those who come into close and prolonged contact with tuberculosis " (p. 73). But I entirely deny that one of the " logical consequences " of this evidence is " that every man, woman, and child who is tubercular should at once be removed from all possibility of contact, direct and indirect, with the healthy community " (p. 125).

---

[1] Dr. Roger M'Neil, M.O.H. for Argyllshire is my authority.

---

[1] 192 out of the 261 cases of a positive nature. Martin (*Revue d'Hygiene*, Vol. VIII., p. 282) states that of 213 cases of apparent infection collected by him, about half were marital.

[2] *The Collective Investigation Record*, edited by Professor Humphrey and Dr. Mahomed, July, 1883, p. 41.

WHAT OUGHT THE LOCAL AUTHORITY TO DO?

In the knowledge of all these facts, what ought the Local Authority to do? The object of the Memorialists is action for " the protection of the community from the infection." Let us first consider infection from man. The suggestions made are very practical. " If the public were authoritatively informed of the harmful nature of all discharges from tuberculous persons, and more particularly from consumption of the lungs, and if they were encouraged to have these discharges rendered innocuous, and also to submit their houses and clothing to disinfection at intervals during the currency of the disease, and again at its close, it is believed that much good would result."

Is Tuberculosis an Infectious Disease?

Now that we have come to the practical issue of this inquiry, it is well at once to raise the question—Is tuberculosis an " infectious disease?" The answer is—Yes and No. It must be apparent from what precedes that, while in the *academic* sense tuberculosis is infectious, in the popular sense it is not. Even in the language of the schools, where words are weighed and meanings are qualified to a nicety, hydrocephalus, although it is tuberculous, cannot in any sense be said to be infectious.

Neither can many forms of tuberculosis of glands, bones, and joints. Until a discharge is established, they cannot be infectious. Indeed, it is doubtful if even those cases of miliary tuberculosis of the lungs which have ended in recovery, in which every deposit has become a gritty particle, ever were infectious, and it is certain that no case of Phthisis is infectious until the expectoration becomes specific. Tuberculosis, therefore, even in an academic sense, is a disease which, though in all cases caused by infection, is not in all cases infectious. There is no other infectious disease of which this can be said. The fact that it is not infectious in the popular sense is of much more importance for our present purpose. The popular idea of an infectious disease is one from which there is no safety save in keeping away from it. Proclaim a disease to be "infectious, and the people will pay no attention to qualifications. It is very natural—don't go near the person, and the conditions of safety need give no trouble! Education makes no difference. The West-end fear of infection is indiscriminating even to absurdity. Enteric Fever, Scarlet Fever, Whooping-cough, Small-pox, all entail the same social ostracism. Belief in the protective influence of revaccination is found to be nothing more than a pious opinion when put to the test of personal conduct in reference to Small-pox. There is already evidence of mischief being done by the indiscriminate attachment of the idea of infection to Phthisis. We have heard of a consulting physician being referred to by a clerk in one of our large warehouses, at the instance of his employers, for an opinion as to the safety of his being permitted to continue in his employment. A distinguished English physician, an authority on Consumption, protesting against the unguarded application of the word "infectious," states that "the result of such teaching is already becoming apparent in many directions. Persons affected with almost any chest disease find it difficult to obtain places as domestic servants. The close ties of family affection are not always strong enough to induce relatives of consumptives to undertake, what is considered to be, the dangerous duty of nursing them. The sites for Consumption hospitals are becoming as difficult to find as those for Fever, and utterly unfounded reports as to the spread of the disease by such institutions are recklessly made, even by medical officers of health."[1] Another practitioner states that he has received from a consumptive patient a note in these words—"Can you tell me whether my disease is infectious to my friends with whom I live? They have been told that it is, and directly I leave one room for another, all the windows are opened, and such a fumigation goes on that I am beginning to feel myself a terrible nuisance."[1]

---

[1] "On the Limits of Infection by Phthisis," paper by Arthur Ransome, M.D., F.R.S.—*Public Health*, January, 1895.

There is a substantial excuse for the popular notion of an infectious disease in the fact that the law does not discriminate between one infectious disease and another. The words have a technical meaning, and every disease in the category is within the scope of every provision of the law applicable to infectious disease—compulsory isolation of the living and of the dead, compulsory disinfection, penalties for the use of public vehicles, for appearance in public places, whether streets or buildings, &c., &c. It may be said that the application of these laws is left to the discretion of authorities, which is true; but one has only to study the opinions advanced by some medical officers of health to be convinced that, before placing tuberculosis officially among "infectious diseases," it is necessary to understand quite definitely what is to follow. There is not a single power of interference with the liberty of persons suffering from Small-pox, the application of which to consumptives has not been advocated. Indeed, one cannot avoid contrasting the studied caution and expressed solicitude to protect the consumptive from prejudice, which characterises the application by the original German investigators of their discoveries to prevention, with the rash utterances of many of those who seek to interpret those discoveries elsewhere. Koch himself showed the example in the closing words of his famous treatise, "It seems to me the time has now come to adopt prophylactic measures against tuberculosis. But, owing to the wide distribution of the disease all steps taken against it have to deal with social relations, and it must therefore be carefully considered in what way, and how far, we may proceed without neutralising, by unavoidable disturbances and other disadvantages, the benefit obtained."

Push aside the proposal to extend such demands to everything that can be designated "tuberculosis" as condemned in the utterance. Consider them as applied to Consumption alone. Recall all the representatives of that pale multitude one has known who bore the burden of their infirmity for years, few or many, who did good work in the world, earned honest wages, supported themselves, supported others; all those one has heard of who lived more in the world's eye, who have instructed or entertained mankind, consumptives who have enriched our book-shelves, given us paintings for our walls, and satisfied our ears with music—Keats, with all his golden store of verse; Chopin, tuneful throughout his long decline; Green, heroically toiling over his brilliant histories; Addington Symonds, man of letters to the last; Sir Thomas Watson's nameless "statesman, who served his country well and strenuously" in a life-long illness[1]; the frail, but fruitful, life of Stevenson; all the phthisical patients to whom Sir Andrew Clark preached from his favourite text—"*Labor Vitae vita est*—Work is the life of life," with himself as the example, born of parents who both died of phthisis, and sent to Madeira at 21 to die.[2] They all suffer from an "infectious disease." They are all to be notified by the first physician who sees them. Each is to be "furnished with a card bearing the date of notification," which they are "required to produce on application for disinfectants, &c.," and which medical men, wherever they may have to consult a doctor, are to ask for, so that they may not cause unnecessary expense by being reported again, for economy must not be lost sight of.[3] The announcement of the sad diagnosis is to be signalised and proclaimed to the world by a domestic ceremony of purification, conducted by the high priests of the sanitary department, to wipe out all the infection which has followed the unfortunate's pestiferous steps while the taint was yet unrecognised. To put an end to this he must "be thenceforward confined to certain parts of the house," in which the ceremony of purification is to be carried out every two months. They are now known to all men as "consumptive people," and are in future to live up to a code. They must abjure pocket-handkerchiefs; when "attending a workshop, assembly, or church," they must "spit into a hand-glass spittoon," which "may be conveniently attached to the person"; their "eating utensils . . . should be kept separate from all eating utensils of other persons"; their "clothing must be washed separately"; their "bowel discharges should be disinfected."[4] Even this is a compromise to which the sanitary puritan reconciles himself by the prospect of an ideal such as this:—"In the wake of compulsory notification would follow a number of regulations all aiming at stamping out Phthisis [surely a misprint for Phthisics!] These subsequent regulations fall easily into three classes—(1) Prevention of patients with actual Phthisis, or, indeed, with strong hereditary predisposition, from marrying. (2) Prohibition of patients with actual Phthisis from frequenting churches, theatres, railway carriages, tram-cars, or any public places. (3) Disinfection of sputa, habitations, and all things coming in contact with phthisical patients. Isolation of the consumptive."[1]

---

[1] "The Necessity for placing Tubercular Phthisis under control, from another point of view."—Dr. Goodhart, *Medical Magazine*, Vol. I., p. 1099.

---

[1] "Lectures on the Principles and Practice of Physic," 5th Edition, Vol. II., p. 236. The names we specify are those not merely of persons who died of consumption, but who were consumptives all their working lives. They are a mere sample which occurs on the moment.

[2] "The Treatment of Fibroid Lung Disease": a Clinical Lecture.—*Lancet*, 6th January, 1894.

[3] Dr. Niven "On the Prevention of Phthisis."—*Lancet*, 10th August, 1895.

[4] Memorandum of the N. W. Branch of the Society of Medical Officers of Health as to the Prevention of Phthisis or Consumption; also Dr. Niven's Manchester leaflet.

Let us rapidly run over the various administrative procedures usually applied to infectious diseases, and consider them as applicable to tuberculosis.

COMPULSORY NOTIFICATION ?

Although this has been frequently recommended in expert reports, and was voted by the Parisian Congress in 1888, and again in 1893, as necessary in reference to tuberculosis in general, the fact is chiefly noteworthy as a warning of the direction in which science, without practical discrimination, is moving. This would cover an enlarged cervical gland, a lupus, a white-swelling, a hydrocephalus, a " cold abscess," every form of local tubercle, as well as a case of Phthisis. The question has in reality, as a rule, resolved itself into a discussion of the propriety of requiring the notification of Consumption. Suffice it to say, that I am not aware of any country or place where this has yet been done. I am not aware of any resolution in favour of compulsory notification having been passed by any body of medical practitioners. On the contrary, the subject has been discussed by the French Academy of Medicine, the College of Physicians of Philadelphia, and the Medical Society of Oldham, with an adverse result. Even the Incorporated Society of Medical Officers of Health of England, when asked to resolve that "tuberculosis should be made a notifiable disease, notifiable under the same Acts, and under similar conditions to such diseases as Scarlet Fever," passed instead a resolution to the effect that they, " while accepting the view that Phthisis is an infective disease, in the prevention of which active hygienic measures should be taken, think it premature to recommend the compulsory notification of a *chronic disease like Phthisis.*" At the same time a rider was added encouraging voluntary notification and disinfection.[2]

ISOLATION ?

Here again it may be mentioned the extremists have proposed that sanitary authorities should provide hospital accommodation for Tuberculosis, but practically the question is one of providing for Consumption. We must carefully distinguish between the humanitarian and the sanitarian aspect of this question. The conditions which determine infection from Phthisis are, as we have seen, very narrow. With proper precautions, they are obviated merely by sleeping alone. In Small-pox and in Typhus they are so wide as to include almost every case; in Scarlet Fever they are sufficiently wide to make removal to hospital advisable in three-fourths of the cases; and in Enteric Fever in about the same proportion. From the present point of view, the essentially dangerous case of Phthisis is the one which is in the last stage, confined to the house or bed-ridden. When a person in this condition cannot have a bed alone, especially if young children must share it, when the material accessories of the special precautions necessary are wanting, when the conditions are hygienically bad, then removal would, from a preventive aspect, be useful. But this is a task different from any hitherto undertaken by local authorities, and one not to be lightly assumed—to provide, not a hospital for curative purposes, but a shelter for incurables, a "Friendensheim," or "home of peace," a place in which to die without endangering the living. Consumption hospitals, in the ordinary sense, are not open to such cases. I confess to considerable sympathy with the opinion of Dr. Squire,[1] referring to this limited class of cases—"A sanitary district should provide a home for its own advanced consumptives, where the sufferers should be received, without thereby incurring the brand of pauperism; these invalids would thus be prevented from being unwilling dangers to others." At all events, any provision which exists for the treatment of Consumption ought to be patronised by the authorities. These doctrines give them a special interest in consumptives.

---

[1] "The Necessity for placing Tubercular Phthisis under Control"—Article by Arnold Chaplin, M.B., in the *Medical Magazine*, Vol. I., p. 1022. Exactly the same regimen is strenuously advocated in an article in the *Forum* for February, 1894.

[2] *Public Health*, September, 1893.

DISINFECTION?

We already, when asked by medical practitioners, wash and disinfect after fatal cases of Phthisis, but we seldom are asked. The circumstances which require precautions in carrying out the washings of consumptives or other persons having tuberculous discharges are restricted very much in comparison with the ordinary infectious diseases. Indeed, we must avoid creating the impression that the bedding and clothing are necessarily infected. It is not so. They seldom are infected. It is the helplessness or carelessness of the patient which leads to infection of his garments, &c. Here again the advanced case, the fatal case, is the dangerous one; so that it would be well that washing and disinfection should, *always after death*, be undertaken by the authorities. If people possess the means of washing properly the clothing of the healthy members of their household, they can also wash the ordinary linen of a consumptive. I see no reason for interference even in the use of a common washing-house. If, however, people have not the requisite accommodation and appliances, if they are untidy and cannot be trusted to carry out any process of washing at all, then it might be carried out by the authorities, each case being considered in view of the circumstances. Whatever danger there is in any case emerges not from mere neighbourhood to or mere touching of articles, or from the act of washing, but from the disturbance of dust when they are dry. The moment they are wet the risk is gone.

---

[1] "The Hygienic Prevention of Consumption," 1893, p. 141

POPULAR INSTRUCTION?

In Glasgow, for the last twenty years, the Local Authority has caused a paper, couched in simple language, entitled "Hints about the Prevention of Scarlet Fever," to be left at every house in which a case is known to exist. While it would be well to take similar means for the instruction of the people regarding tuberculosis, the dissemination of the knowledge of the facts we have been considering through the mass of the public must depend chiefly upon the medical profession. No doubt, every case of consumption will be made the occasion of some detailed instructions as to the nature of the risks entailed upon the family, and the method of obviating them. But there is room and use for popular instructions applicable to the special risks of consumption and of strumous sores. These might be supplied to public dispensaries, and given there to the appropriate patients; and, no doubt, many practitioners would welcome such papers for the more speedy and certain information of private patients. What ought to be in such pamphlets? We certainly do not wish any exposition of the whole etiology of tuberculosis. We do not wish to call names, and to run the risk of false impressions therefrom. We would meet the occasion of a case of consumption or a case of open tuberculous sores, and state as plainly as might be under what conditions the patients may live in the family, and follow the ordinary intercourses of life, without causing risk to anybody. We would preach the gospel of cleanliness, fresh air, and sunshine, from a new text.

The publication of Cornet's papers on "The Distribution of Tubercle Bacilli outside the Body," in 1888, and "On the Mortality among Nurses and its Causes," in 1889,[1] gave an impetus to preventive measures against tuberculosis, which practically meant against Phthisis. In Prussia instructions were at once issued applicable to all state institutions—hospital, asylums, prisons, &c., and to military hospitals. These official instructions, and others issued by local authorities, especially of continental health resorts, such as San Remo, Meran, &c., were published, so far as then issued, as an appendix to Cornet's reprinted papers in 1890. In America these papers immediately attracted the attention of health authorities. A translation of the most important passages appeared in the Annual Report of the Board of Health of the State of Maine for 1888. At their first session in 1888, the Congress for the Study of Tuberculosis held in Paris resolved that it was expedient to distribute popular instructions as to the sources of infection and the means of combating them. These were drawn up and submitted to the Royal Academy of Medicine, who referred the draft to a commission. In the interval Cornet's first paper appeared, the influence of which was very manifest in the revised draft of next year. In 1889, at the instance of Dr. Niven, Medical Officer of Health of Oldham, a handbill of "Precautions against the Communication of Consumption" was distributed to the inhabitants of that town. Thus, almost at once and simultaneously, Cornet's investigations and eminently practical conclusions led to preventive measures, a part of which always was the instruction of those in charge of consumptive patients. The nature of Cornet's conclusions was such that this was essential. Besides the various documents and the draft codes referred to above, I have before me other leaflets and pamphlets for popular information. A list, with notes on their contents, will be found in the Appendix.[1]

---

[1] *Zeitschrift für Hygiene*, November, 1888; February, 1889.

One of the most interesting and instructive incidents in the application of the modern doctrines to the prevention of tuberculosis was the discussion just referred to, which was started before the Academy of Medicine by the code of popular instructions which Verneuil and Villemin had drafted for the Tuberculosis Congress. These gentlemen hoped to obtain for their code the authority of the Academy, but so much diversity of opinion emerged that the draft was remitted to a commission of five, including its authors. A revised code was duly submitted, and, after being discussed at nine several meetings, at which the greatest suspicion was manifested of every phrase which might lead to exaggerated or ill-defined fear of consumptives, the Academy could only be got to agree upon the following simple propositions, in place of the elaborate paper submitted by their commission in five principal and eleven subordinate paragraphs!—

---

[1] Not reproduced.

"1. Tuberculosis is a parasitic and contagious disease. The microbe, which is the medium of infection, resides especially in the dust produced by the expectoration of consumptives and the pus from tuberculous sores, when dried. Therefore the most certain method of preventing contagion is to destroy the expectoration and pus by boiling water or fire before they become dry.

"2. The parasite is also sometimes found in the milk of tuberculous cows, so that it is prudent not to use milk until it has been boiled, especially if it is for the use of children. The Academy calls the attention of the authorities concerned to the risks imposed by tuberculous persons on communities under their charge, such as schools, barracks, large establishments, and state workshops."[1]

I have already remarked upon the tendency of the disciples of Koch, Cornet, and Heller, especially in this country, to out-Herod Herod in the application of their doctrines. One naturally looks to Cornet himself and to the city where he resides, where, in fact, the bacillus was discovered, and whence nearly all we know of it has been announced to the world, for guidance as to what it is expedient to teach the people as to Consumption, and what it is necessary to require of consumptives by way of precaution for the safety of others. Here are (1) a leaflet which Cornet is in the habit of giving to his patients; (2) a leaflet issued by the Municipal Authorities of Berlin :—

I.—CORNET.

PROTECTION FROM CONSUMPTION.[2]

"The most destructive disease of the human race is Consumption (Tuberculosis). It carries off a seventh of the population (*sic*). In Germany alone there die yearly of Consumption well nigh 150,000 people.

"It has now been discovered that this disease is caused by the inhalation of a germ, a so-called bacillus. It is infectious, that is, it can be given by any person to another. But neither the breath nor the perspiration of the patient is at all dangerous, as used to be supposed. Infection generally takes place through the spit, and, according to the latest enquiries, especially when the spit is discharged by the consumptive upon the floor or in a handkerchief, where it dries and becomes dust, and some of the swarm of germs contained therein are inhaled by healthy people.

"Many other diseases, such as Diphtheria, Pneumonia, and various forms of Catarrh, may be communicated in a similar way.

---

[1] *Reveue d'Hygiene*, 1890, p. 176. There is a very full *precis* of these discussions in the volumes for 1889 and 1890, which is well worth reading. The draft code may be found at p. 44 of the vol. for 1890.

[2] "Ueber Tuberculose," &c., &c., von Dr. George Cornet, Leipzig, 1890, p. 145.

"Consumptives endanger not only those about them, but themselves, through the drying of their spit, because they again inhale the discharged and dried bacilli, and thus infect hitherto sound parts of their lungs.

"Such infection may be avoided if consumptives, and, indeed, all who have a chronic cough with expectoration, keep this expectoration always moist; if they give up spitting on the floor or into a handkerchief, and always use a spittoon which is emptied down the water-closet.

"Spittoons must be placed wherever it appears necessary, in every enclosed space frequented by men. They ought not to be filled with sand or sawdust, but either left entirely empty or supplied with a very little water. They ought to be at hand in sufficient numbers in every apartment of houses, in workshops and factories, in counting-houses, schools, offices, public places, in corridors and on stairs, so as to give every one a convenient opportunity of observing these injunctions.

"In this way healthy people who have to remain within the same room as consumptives will be almost entirely protected from infection.

"Posters ought to be put up in factories, workplaces, etc., forbidding most strictly spitting upon the floor or into a handkerchief.

"On the street, where spitting can scarcely be prevented, certain other circumstances diminish the risk of infection.

"Let every man, even though suffering from an ordinary cough, discharge his spit, not on the ground, not in a pocket-handkerchief, but always in a spittoon.

"Milk ought, as far as possible, to be used only after boiling, especially by children, invalids, and convalescents.

"By the strict observance of these injunctions, consumptives are made almost harmless to those about them; and all the more that the bacilli can live outside the body only for about six months, it may be hoped that, if these rules are followed out by the sick, Consumption in general will diminish."

II.—BERLIN.

MEASURES AGAINST THE SPREAD OF CONSUMPTION.

"Pulmonary and Laryngeal Consumption (Tuberculosis) is communicated to the healthy by means of the tubercle-bacilli contained in the expectoration of the sick, when the spit dries, becomes dust, and is thus inhaled. The discharges from the bowels of such persons may in like manner act injuriously.

"*If those matters are rendered harmless, the spread of Consumption is prevented;* the healthy are protected from the sick.

"In order to prevent drying and the production of dust, the consumptive, indeed *every* person who has a cough (people with a cough are often not aware that they are actually coughing up tubercle-bacilli), ought to spit in vessels containing a little water (spittoons of earthenware or glass). No person ought ever to spit upon the floor or into a pocket-handkerchief. For the reception of sputum, spittoons should be placed in the dwellings of all who are ill with a cough, and, indeed, in all houses, on the stair landings, but especially in such buildings and rooms as are used by the public (hotels, restaurants, places of amusement, meeting-places of all kinds, schools, etc.). These spittoons should be 8 to 10 inches in diameter, 2 inches in height, with *smooth* slightly inverted edges, made of strong *smooth* glass, porcelain, earthenware, or enamelled iron, containing water to the depth of half-an-inch or thereby. In places of public resort there should be a clearly legible inscription on the wall—'*Spittoon for the use of persons troubled with cough.*' The water must be renewed as it evaporates; the spittoons to be emptied down the water-closet, and washed daily with boiling water.

"*Cleanliness of all* places is *the first condition* of a *successful* public health administration; consumptives ought *especially* to study cleanliness.

"The sitting and sleeping rooms of consumptives ought to be provided with washable curtains, table covers, etc., with no carpets on the floors, or woollen runners on the stairs, and contain as little furniture as possible, with washable, easily removable covers (dusters). Elastic iron garden seats, with washable covers or movable cushions, are the most suitable furniture, and facilitate cleaning and disinfection of the room and its contents. Bedmats should be made of washable jute material.

"Wipe the *whole* floor of every room over with a damp cloth daily to remove the dust, and even in winter ventilate thoroughly for *at least* an hour. The room should be thoroughly cleaned weekly, and every three months be disinfected, according to the directions of the Code of 7th February, 1887, prescribing the process of disinfection in epidemic disease. The fulfilment of these instructions, especially the harmless removal of the expectoration, enables the intercourse of the healthy with consumptives to be carried on without scruple, and prevents the spread of this most destructive disease.

"May everybody, according to his circumstances, co-operate to this end."

It is characteristic of all official action in Germany in relation to the person of the consumptive to concentrate attention upon his expectoration. Every detail of injunction, as well as express statement, has the effect of liberating the consumptive from all social disability, so long as he is able to go about, *provided* he is careful to follow the simplest precautions as to expectoration; and when he is weak and bedridden, *provided* his attendants take up the *rôle* as to expectoration and are cleanly as to his other discharges. It is the same in France. Out of the periodic " Congress for the Study of Tuberculosis " sprang a " League for the Prevention of Pulmonary Phthisis and other forms of Tuberculosis," the primary object of which was to educate the people of France by the circulation of popular literature, each member acting as a distributing centre in his own locality. Their first issue was the code of instructions which received such drastic treatment at the hands of the Royal Academy. This was included in a pamphlet of 12 pages, which has been scattered broadcast over France. The code itself is prefaced by some facts to show the gravity of Phthisis as a cause of ill health and death, and by an exposition of the modern doctrine, in the course of which this sentence is printed in emphatic type:—

> "We know further that the consumptive is not in the least dangerous by contact or proximity, that it is neither his body nor his breath which is hurtful, and that we can chat with him for hours, live with him for years, and even sleep in his room and give him the most constant care, without running any serious risk, *provided we take certain precautions*, the chief of which is to collect his expectoration, and not to delay the destruction of his spittle until it becomes dry, and is disseminated as dust into the atmosphere."

This position is logical and unassailable. If you accept the doctrine as sound, the practice must be conceded as sufficient. Let there be spittoons handy for everybody; don't put your spit of the way of drying and becoming dust; don't anywhere stir up the dust in enclosed places. The remedy is so commonplace that, after reading all that has been written and spoken, and proclaimed and enjoined, when we look at our notes and find nothing but sputum, spittoons, and dust, we are apt to show a little temper, like Naaman when he expected the prophet to hold a solemn function over his leprosy, and he merely told him to go and wash himself. No doubt, the very simplicity of the prescription will constitute the greatest difficulty in the way of its acceptance and observance. To the vulgar a " spittle " is symbolic of all that is insignificant and contemptible. To base a cardinal matter of sanitary practice and regulation upon the how, and the when, and the where, people are to spit, requires some moral courage. Only a clear apprehension of, and firm belief in, the doctrine that practically Consumption is communicable through dried expectoration, and nothing else, will save the practice from ridicule.

How far it is to be explained by the fear of this—how far by the imposition of modern doctrines upon the top of the conception of a vague infection, instead of entirely substituting the one for the other—we cannot say; but the fact remains that in this country the advocates of the modern doctrines never seem to regard the consumptive with any more equanimity. They expound the *modus operandi* of infection; they prescribe spittoons and proscribe dust, just as is done on the Continent; but in place of manifesting confidence in the consumptive thus reformed in his habits, as they most expressly do abroad, the tendency here is to exhibit suspicion of him in all his ways. They would surround him with restrictions, and cover him with differential marks, which must make him almost as conspicuous in society as if he were clad in the grey gown and sounded the clapper of a mediæval leper—

> "They curse him in eating, they curse him in drinking,
> They curse him in coughing, in sneezing, in winking."

The jackdaw of Rheims was not "a penny the worse," but it would be far otherwise with the poor consumptive. Well may one say, "Show us your faith by your works"; but it is not the logical inconsistency, it is the cruelty, the inexpediency of these restrictions which moves our criticism. They are cruel and inexpedient, because unnecessary. They deprive the consumptive of the very advantage of the modern doctrine to which Cornet never tires of adverting, "The consumptive in himself is almost absolutely harmless, and only becomes harmful through bad habits" (p. 130). Setting out from this proposition, he says, Prophylaxis is therefore simple. No more demands for legislative prohibition of marriage and other absurdities of restriction, which would consign consumptives to an island in the solitary ocean. No more demands for the separation of children from tuberculous parents, for their accommodation in institutions, for abstinence from kissing them,[1] for avoidance of intercourse with consumptives, for exclusion of consumptive workmen from workshops, &c. Cornet thinks such prescriptions about the furnishing of rooms for consumptives as those in the Berlin leaflet, and as to special disinfection of sputum are futile for private houses; the hygienist must endeavour to make his demands consistent with the comforts and habits of civilised life, otherwise his voice will be as that of one crying in the wilderness. This is now possible. Prophylaxis had of late come to a standstill because of its impracticable demands. Koch's discovery, the most fruitful in medicine, seemed to exhaust itself in staining bacilli.[2] In short, Cornet has proved by experimental induction, if ever anything has been proved, that the sputum is practically the only source of infection in Phthisis; that where there is no sputum there is no infection; that the sputum is not infectious unless it dries; that it cannot dry excepting under certain conditions, perfectly easy to be avoided; that if these conditions are avoided, a consumptive is not a source of danger to any one in the ordinary intercourse of society and the home. If this is so, we must say so; and we must not act, or make others act, as if we did not believe it.

---

[1] He means kissing on the cheek or brow, which he advises in place of osculation.

[2] "Ueber Tuberculose, &c.," 1890, pp. 130 *et seq.* He recurs to the same subject in his paper, "Die Prophylaxis der Tuberculose, &c."—*Berliner klin. Woch*, May, 1895.

TUBERCULOUS MEAT AND MILK.

The recent Royal Commission on "The Effect of Food derived from Tuberculous Animals on Human Health," as is stated in the Report, was not instructed to inquire into or report on "administrative procedures available for reducing the amount of tuberculous material in the food supplied by animals to man," and consequently authorities must deliberate upon the Report, and come to their own conclusions as to their action. In Glasgow the interest in the Report is rather different. In 1889 we took up a position, and successfully asserted it in Court, regarding tuberculous carcases. In the Glasgow Police (Amendment) Act, 1890, Sections 26 and 27, we took up a position with reference to tuberculous cows and their milk. Does the Royal Commission support these positions? Owing to the omission in their instructions, the answer can only be reached by argument upon the facts which they report. In my opinion the Report amply confirms our position, both with reference to meat and milk. Unfortunately, the aspect of the meat question put before the Commission was too purely academic. This probably arose from their being precluded from considering administrative issues. A carcase is an article of commerce. If any superficial tubercle is perceptible to the naked eye of the Inspector, he cannot proceed to cut up the carcase into sections to ascertain how far the disease extends into the lymphatics, bones, &c. Every unusual incision depreciates its value. No person would defend the sale of a single visible tubercle as a part of the weight of a pound of meat purchased for human food; but is the butcher to be trusted to carefully dissect out a tuberculous gland if he even cuts it across in helping his customer? He can't do more, for the same reason which prevents the Inspector cutting up a carcase. Hence arise rough rules of practice, which, to begin with, assume that the Inspector sees the viscera *in situ*. They all affect to remove visible tubercles, and assume that there are no invisible deep-seated tubercles. When no viscera are produced, the guess at the general condition of the carcase must be still wilder. All this is exclusive of the more subtle question of localized *v.* generalized tuberculosis (not tubercle), *i.e.* of tuberculosis which consists wholly in fixed nests of bacilli which may be excised, and tuberculosis in which the bacilli are careering through the tissues in the blood and lymph-streams. These practical aspects of the conditions of meat inspection deprive such a statement as this of all weight or importance.

"82. Provided every part that is the seat of tuberculous matter be avoided and destroyed, and provided care be taken to save from contamination by such matter the actual meat substance of a tuberculous animal, a great deal of meat from animals affected by tuberculosis may be eaten without risk to the consumer."

We turn to the body of the Report, and we find—

"38. We have now to point out the very great difference in one and another part of a tuberculous animal in the amount of tuberculous matter contained in the meat. This matter is found principally in the organs of the animals; as a rule, most abundantly in the lungs, lymphatic glands, serous membranes, but often in the liver, spleen, kidneys, intestines, and other structures. These organs are usually removed by the butcher in 'dressing' the carcase, though some of them may, intentionally or not, be left. To a practised eye it is hardly possible that tuberculous matter in these organs can escape detection, and the importance of its presence there will soon be apparent;

"39. For, in the tissues which go to form the butcher's 'joint,' the material of tubercle is not often found, even where the organs exhibit very advanced or generalized tuberculosis; indeed, in muscle and muscle juice it is very seldom that tubercle-bacilli are to be met with; perhaps they are somewhat more often to be discovered in bone, or in some small lymphatic gland imbedded in inter-muscular fat. *Yet there is always a difficulty in making sure of the absence of tuberculous matter from any part of a carcase that shows evidence of tubercle elsewhere.*"

The practical outcome of all this is, that for experimental purposes you can dissect from a "joint" of a tuberculous animal a bit of "muscular tissue" which contains no crude tubercle, and not even a bacillus; but if the Inspector sees crude tubercle anywhere, he never can be sure where it is not, buried out of sight or smeared by the knife over apparently healthy flesh. The former I call the academic, the latter the practical view of the matter. It is all very well to demonstrate that fragments of meat might be safely salvaged from tuberculous carcases and restored to the food-resources of the community. Nothing will satisfy the butcher but passing those carcases on into the market, whole or in normal segments, so that these shall fetch the same price as corresponding portions of a healthy carcase. He objects to the source of this meat being known. To ask him to "exercise sufficient discrimination and care in taking meat from tuberculous cattle" is not business from his point of view, nor, in fact, from any point of view. This must be done by officials, if it is done at all.

There is no need for argument in reference to the milk of tuberculous cows. The facts are so universally accepted and so grave, that the administrative effect shines through them. It is precisely the Glasgow position—that a tuberculous cow must not be retained in a dairy byre (par. 63). There is a remarkable consensus of opinion as to the influence of milk in disseminating tuberculosis, especially amongst the young. The pathologist finds "that of the total deaths under 10 years of age amongst the mass of the people, about a third are due to tuberculosis,"[1] and that the usual seat of the disease at that age points to food as the medium of infection. The prevalence of tuberculosis among dairy cows is notorious. Experiment shows that when the udder is affected the milk is virulent. Every authority on the prophylaxis of tuberculosis places the supervision of the milk supply next to the regulation of the expectoration of consumptives in importance. I am inclined to think that it is at least of equivalent importance. It certainly is much more practicable as a matter of sanitary administration. If we remember the habits of the tubercle-bacillus, we cannot imagine a more favourable nurture-ground than the typical byre—a dark or badly lighted space, with insufficient ventilating apertures, which are unhesitatingly closed when necessary to maintain a temperature of 60 deg. to 70 deg. F. by the heat of the animals; the air consequently loaded with carbonic acid, with organic impurities and moisture, full of the dust of dried dung, never penetrated by a direct ray of sunlight, in winter never vacated either in country or town for weeks, and in cities never vacated at all.[2] Well may Professor Brown, of the Agricultural Department of the Privy Council, say—"Nothing worse than the insanitary conditions of the life of the average dairy cow can be imagined." The natural result is that dairy stock is ravaged with tuberculosis. Yet we never hear a farmer or a dairyman speak of tuberculosis without speaking of compensation. When he puts windows in his byre, and floods it with light, ventilates it, and ceases to use his cow as a heating apparatus, it will be time enough to speak of compensation. Meanwhile the children of the town are being infected wholesale, and it behoves the authorities, not only to take every means to eliminate tuberculous cows from dairy byres, but to enforce sanitary reform in the construction, use, and condition of byres. Bye-laws as to cubic space, ventilation, lighting, cleanliness, obtain from tuberculosis a direct interest to all men. But yet more is required. The Glasgow Police (Amendment) Act, 1890, contains powers which, if efficiently worked, would weed out tuberculous cows, not only from Glasgow byres, but from any byre from which milk is sent to the city. In Glasgow there are some 1600 cows, of which 40 per cent. are never outside their byres. In 1892-3-4 there were 23, 9, 7 tuberculous cows detected and eliminated by the inspectors; but the method of inspection is thoroughly inefficient. A competent veterinary inspector ought to be at once appointed, who could test with tuberculin the accuracy of the suspicions suggested by his skilled general examination. In this way only can we hope to detect and abolish, as milk-producers, animals which are, no doubt, at this moment contaminating the milk supply of Glasgow. At present our powers are lying dormant. After putting our own house in order, an occasional inspection of the cattle at dairy farms, chosen at random in various parts of the country, would have a most wholesome effect, not limited to the detection of a few unsound animals, but leading up to more stringent bye-laws and better sanitation in country byres. County officials require a little help from the powerful commercial lever which the purchaser of country produce can apply whenever he chooses.

---

[1] "Tuberculosis viewed as an Infectious Disease; its Prevalence and the Frequency of Recovery from it."—Professor Joseph Coats, *Sanitary Journal*, 23rd November, 1891.

[2] See valuable paper by J. MacMillan, M.B., D.Sc., Edinburgh.—"An Investigation into the Condition of the Atmosphere of Cowhouses and Stables in Edinburgh, Leith, and the County of Midlothian."—*Journal of Comparative Pathology and Therapeutics*, 1892.

GENERAL HYGIENE IN THE PREVENTION OF TUBERCULOSIS.

STATISTICS.

In May of this year Cornet read a paper to the Berlin Medical Society on "The Prophylaxis of Tuberculosis and its Results," in which he adduces statistics to prove that a great reduction in the mortality from tuberculosis had followed the adoption of precautions on the lines of his investigations. The new regulations came into force in the spring of 1889 in prisons, lunatic asylums, and hospitals. The paper contains detailed tables, the effect of which may be summarised. In prisons there has been a fall of 54 per cent., in lunatic asylums of 15 per cent., and among the nursing orders of 36 per cent. In the case of the prisons the last year given is 1893, in the case of asylums 1891, and of nurses 1894, so that all this improvement was effected in from 2 to 5 years. Cornet also gives statistics from which we may select two illustrations. In Prussia the mortality from tuberculosis in 1879-83 was 31.5 per 10,000. In 1889-93 it was 26.6, a fall of 16 per cent. in five years. In Saxony the mortality from Consumption in 1879-83 was 24.7. In 1889-93 it was 22.4, a fall of 10 per cent. in five years. In the subsequent discussion, Professor Virchow, while thoroughly supporting Cornet's system, expressed, amid audible signs of approval, his doubts as to the statistics. Regarded as results, these seemed to him essentially too great. Dr. Baer, medical officer to one of the largest penitentiaries, stated that, coincidentally with the special prophylaxis, great improvements in the general hygienic condition, including increased cubic space and a more liberal dietary, had been introduced. He said, " However powerful prophylaxis may be against the spread of tuberculosis, the diminished mortality from Phthisis in prisons of late years cannot be ascribed to it. Other essentially different hygienic measures of the highest importance have effected that which Dr. Cornet wished to ascribe solely to prophylaxis." Although this drew from him the remark that " salvation was not to be found in the spittoon alone," no other impression could be received from the paper than that which his audience evidently did receive.[1] Yet it is well-known that long before bacilli were heard of, or any idea of attacking Phthisis on the lines of infection had been promulgated, it has yielded extraordinary results to simple hygienic measures: results excelled in the case only of Cholera, Typhus, and Small-pox, even with the help of all the special methods applicable to those diseases, and not equalled in the case of any other infectious disease. The accurate and scrupulous Parkes, in considering the causes of a Phthisis mortality among British troops of 7.86 per 1000 in the 17 years ending in 1846, in contrast with 2.6 in the 22 years ending 1880, says, " There is only one condition which seems capable of explaining it, viz., overcrowding. . . . It is the only condition which has undergone a very decided change both at home and abroad."[2] By giving our soldiers more cubic space and better ventilation, we have reduced the death-rate from Consumption 67 per cent. In 1865 Simon brought into prominence a list of 15 towns in which sanitary works, more particularly the drying of the soil by the laying down of main sewers, had reduced the mortality from Phthisis within periods of time ranging from 3 to 11 years by from 11 to 49 per cent. This was the result of investigations carried out by Buchanan, the gist of which was formulated in the law that " dampness of soil is an important cause of Phthisis to the population living upon the soil."[3] Dr. Janssens, who has made Brussels the centre of light and leading on the Continent as regards practical sanitation, thus introduces to his city the code of "Practical Instructions for the Prevention and Control of Tuberculosis," promulgated by the Belgian Central Council of Public Health this year :—"Doubtless the number of deaths caused by pulmonary tuberculosis is heart-breaking, but let us say at once we may derive from it facts calculated both to comfort us and to give us confidence as to the future, if we contrast separately the successive periods of the interval between 1864 and 1893. As a matter of fact, thanks to the sanitary measures which have revolutionised the hygienic circumstances of our city, and to the increase in the comforts enjoyed by our population during last quarter of a century; thanks also to the organisation of its sanitary department, and to the vigorous application of the hygienic principles on which now both the preventive and curative treatment of tuberculosis is based; thanks, finally, to the preventive treatment first applied by the city in 1874, from which about 3000 of its school children profit, the capital has had the satisfaction of seeing for the last twenty years a remarkable and progressive diminution in the annual mortality from Pulmonary Phthisis." He then states that in the three decennial periods—1864-73, 1874-83, and 1884-93—the death-rate from Consumption in Brussels was 46, 40, and 31 per 10,000. This represents a diminution of 33 per cent. in ten years from general hygienic measures alone.[1]

---

[1] See paper and discussion in *Berliner klin. Woch.*, 20th May, 1895. With reference to the exaggerated estimates occasionally made of the number of persons in the community suffering at any one time from Phthisis, it may be well to mention that in this paper Cornet deals with the correct method of estimation in a very satisfactory manner on the basis of the average duration of illness. "The tuberculous person is not so all his life; only the years of his illness are important in relation to infection." He calculates that in Prussia, in 1891-92, one male in 128·5, and one female in 153·3, was tuberculous. Applying these figures to Glasgow in 1894, gives in round numbers 5000 persons suffering from Phthisis. As this disease is distinctly more fatal in Prussia than in Glasgow, this is certainly not an under-estimate.

[2] *Hygiene*, 6th Edition, 1883, p. 607.

[3] Simons' *Public Health Reports*, Vol. II., p. 337.

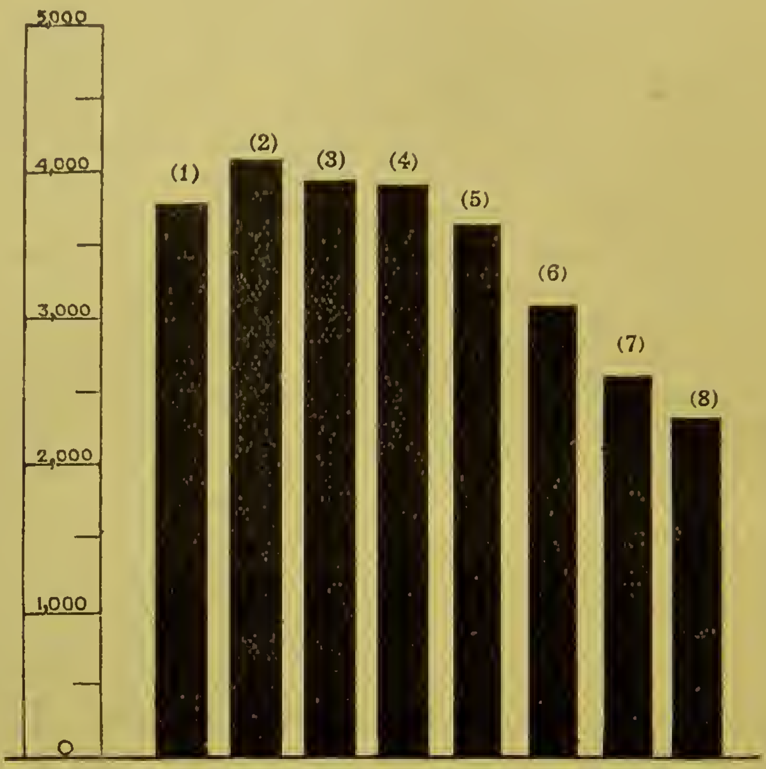
Glasgow itself affords another equally remarkable illustration of the influence of general hygienic measures upon tuberculosis, as is shown in the following diagram (see p. 562) :—

In the period 1860-64 Phthisis reached its highest mortality, 4094 per million. In the period 1890-94 it was 2315, so that in 25 years Consumption has been reduced 44 per cent. in fatality without special treatment as an infectious disease. If we turn to "Zymotics" for the same periods, we find that the combined effect of special efforts and general hygienic measures has been to reduce their fatality 50 per cent. Enteric Fever, which we are told tuberculosis most resembles as an infectious disease, was reduced 60 per cent. The proportion of the total deaths which took place in isolation rose from 7 per cent. to 66, which serves as an index of the extent to which every known special method was pushed. The reduction in Phthisis is very notable even by the side of these figures. Unfortunately, Phthisis is the only form of tuberculosis which has been throughout consistently classified by the Registrar-General as a cause of death. Prior to 1883 there

---

[1] "Instructions pratiques pour prévenir et combattre la Tuberculose. Rapport par le Docteur E. Janssens, Inspecteur en Chef de la Division d'Hygiene de Bruxelles, 1895." See p. 80 for text of Instructions.

GLASGOW.—Death-rate per Million from Phthisis in Quinquennial Periods for 40 Years, 1855-94.



(1)—1855-59. (2)—1860-64. (3)—1865-69. (4)—1870-74. (5)—1875-79.
(6)—1880-84. (7)—1885-89. (8)—1890-94.

was a class "*Tubercular Diseases*," comprising "Scrofula," "Tabes Mesenterica," "Phthisis," and "Hydrocephalus," but in 1883 these were all transferred to "*Constitutional Diseases*," as "Tabes Mesenterica," "Tubercular Meningitis (Acute Hydrocephalus)," "Phthisis," and "Other Forms of Tuberculosis, Scrofula." A table is appended giving the returns for the 40 years as published, but the sequence of the figures shows that after 1882 "Hydrocephalus," at any rate, does not represent the same thing; and information confirms what the sequence suggests, viz., that "Scrofula" also is not the same. We are, therefore, shut up to the 12 years, 1883-94, for evidence of the movement of tuberculous diseases other than Phthisis. Dividing them into two periods of 6 years, we find that the death-rate from "Phthisis" has fallen from 2849 per million to 2316, and from "Other Tubercular Diseases" from 1090 per million to 884, in both cases 19 per cent.—a result which quite casts into the shade the improvement in Prussia and Saxony, quoted from Cornet, which he puts to the credit of special prophylaxis. Clearly, then, we are warranted in asserting that among infectious diseases, tuberculosis is the most amenable of all to general hygienic measures; that, in fact, from these alone as good results are obtained as from hygienic measures plus isolation, disinfection, &c., &c., in the case of diseases popularly known as infectious. It is not implied that special measures directed against the infectivity might not have produced even better results; but in view of what has been accomplished, and in view of the difficulties in the way of special prophylaxis, it is contended that more is to be expected from general hygiene.

The Dwelling and Consumption.

We have already gone with some detail into the relation of local and general health to tuberculosis through their influence on the bacillus. Everything within the control of the individual which promotes and maintains soundness of body; everything within the control of the municipality or the State which improves the physical conditions beyond which the individual living in populous communities cannot go, which raises and maintains the standard of public health, comes within the scope of the prevention of tuberculosis. So that, to treat this aspect of prevention in its fulness, would be to write a treatise on private regimen and State medicine. Nevertheless, there are some of the elements of health which tuberculosis marks with special importance.

A copious supply of pure air and distribution of direct and diffused sunlight within and without the dwelling are not only wholesome to man, but are directly fatal to the bacilli distributed outside the animal body. Sunlight is the only disinfectant which sustains the man while it kills the microbe. Therefore, whatever withdraws from the air we breathe impurity of smoke, or dust, or foul exhalation, and from the sky above us that canopy of smoke which reduces our sunshine to twilight; every thing which promotes free motion of air without and within the house; every bye-law which regulates the width of streets, the height of houses, the arrangement of buildings, so as to offer no obstruction to the winds, and to secure as much light and as little shadow in the hours of daylight as possible, which promotes the access of the sun's rays to dwellings, and helps to make the sky visible from the floor of all inhabited rooms, which widens and brightens lobbies and staircases in tenements, which prevents dampness of foundations and walls; every regulation which checks overcrowding both in house and work place, which protects the artificer from irritating dust and fumes and secures to workers of every degree and kind natural light and pure air in the place of their employment;—all are precautions against tuberculosis. Dr. Thorne Thorne has drawn out what may be called a specification for building a dwelling-house which will promote, and a dwelling-house which will prevent Consumption. Here they are in parallel columns:—

"*Conditions of Dwelling-house tending to the Promotion of Tuberculous Consumption.*	"*Conditions of Dwelling-house tending to the Prevention of Tuberculous Consumption.*
"1. A soil either (*a*) naturally damp and cold, or (*b*) subject to the influence of the rise and fall of a subsoil water lying within a few feet of the surface.	"1. A soil which is dry (*a*) naturally, or (*b*) freed by artificial means from the injurious influence of dampness, and of the oscillations of the underlying subsoil water.
"2. A dwelling-house of which either the foundations, the area they enclose, or the walls are, by reason of faulty construction or otherwise, liable to dampness.	"2. A dwelling-house so constructed as to be protected against dampness of site, foundations, and walls.
"3. Such immediate surroundings of the dwelling-house as tend to prevent the free movement of air about it, and its ample exposure to the influence of sunlight.	"3. Such open space on at least two opposite sides of the dwelling-house as shall secure ample movement of air about it, together with its free exposure to the influence of sunlight.
"4. Such structural defects as would prevent the maintenance within all parts of the dwelling-house of ample movement of air by day and night, and free exposure of its habitable rooms to daylight."	"4. Such construction of the dwelling-house as will secure for its habitable rooms and throughout its interior free movement of air by day and by night, and the free access of daylight."[1]

The lungs are like every other organ, their health is promoted by free and full use. Deep inhalation of pure air—especially the open air, the air which is moving freely in the great currents we call winds, which is clarified by sunshine—gives vigour to the lungs, and supplies the heart with well oxygenated blood to be sent throughout the body, increasing the insusceptibility of every tissue. Therefore, every public park, and the flowers and music which attract people thither, every open space and children's playground, every cricket and football field, every gymnasium and drill-ground, is a precaution against Consumption.

It is remarkable with what unanimity those who have studied Consumption clinically testify that no diseases predispose to it more frequently than Enteric Fever, Scarlet Fever, Measles, and Whooping-cough. Enteric Fever produces a profound and long-continued depression of the vitality, which favours the lodgment of the bacillus. If, perchance, tuberculous milk should be given to such patients, who are practically sustained for weeks on milk and nothing else, it certainly would infect. Scarlet Fever, in its severer forms, also reduces constitutional resistance. On the other hand, Measles and Whooping-cough create for the bacillus an opportunity chiefly by their influence on local health, producing debility in the lungs, to which Whooping-cough frequently adds great general exhaustion. It follows from these facts that all hygienic measures which tend to prevent Enteric Fever, and whatever is done to limit the spread and prevent the complications of the infectious diseases of children, are precautions against Consumption.

---

[1] "The Dwelling-house in Relation to Tuberculous Consumption."—*The Practitioner*, vol. 46.

In combating tuberculosis in the lower animals, hygienic measures bear an equally important part. Indeed, the tuberculosis of animals is begotten of the domestication of animals by man, and the perversity of man in treating them as if fresh air and sunlight were less essential to their health than to his own. The fact is they are more essential. Tuberculosis prevails among the different species in proportion to the extent to which man has, for his purposes, made them denizens of closed spaces; and most of all in the cow, which he has entirely taken possession of, and which he treats as if foul air and darkness were conditions of its being. Dogs and cats also share in the risks of the society of consumptives who are careless in their habits. The improvement of the hygiene of the domestic animals is a precaution against Consumption in man.

SUMMARY OF SUGGESTIONS.

1. It is of supreme importance, first of all, to lay in the mind, both of the profession and the public, a broad foundation of positive knowledge. The direct and indirect practical issues of the doctrine of tuberculosis are very various, and can only be effectively worked out through the intelligence of the community. They touch the business of administrative bodies of every kind, not merely municipal, but parochial, charitable, corrective, educational, and others both of a public and private character. They affect the personal habits of a considerable proportion of the citizens, and the duties of those about them, and, in certain circumstances, responsible for them. They concern the health of all. I believe the preceding Report will be accepted by the Memorialists as a fair presentment of their case, and as suggesting a course of administrative action which is, in general, reasonable and adequate. In my opinion, there-

fore, the first thing to be done is to have this Report printed and considered by the Local Authority, who ought, thereafter, to come to some resolution regarding it, and, if the purport of that resolution is favourable *in general* to its contents, then, with this *imprimatur* the Report ought to be sent to every member of the medical profession practising in Glasgow, to the medical officers of all institutions, to all Boards responsible for the regimen of any part of the community (*e.g.*, parochial, school, hospital, reformatory, &c., &c.), and freely to all citizens who lead and guide.

2. The Local Authority ought to resolve that, in the interests of public health, it is necessary that washing and disinfection should be effectively carried out after every death from Pulmonary Consumption, and at the discretion of the Medical Officers in the course of illness from this or any other form of tuberculous disease.

3. In my own opinion, and, I believe, in that of the Memorialists, the importance of taking immediate action in the direction of eliminating tuberculous cows from the dairies, first of all in Glasgow, and next from those sending milk into Glasgow, can scarcely be exaggerated. It is at least equivalent in promise of beneficial results to any part of the special action recommended in this Report. Glasgow is in the unusual position of possessing ready to hand the legal powers to deal with this source of tuberculosis. We cannot take full advantage of these powers without a veterinary expert. Science has provided in tuberculin a test which overcomes that difficulty of diagnosis of tuberculous disease in the living animal which has hitherto made professional opinion uncertain or only equivalent to suspicion, and therefore insufficient to support decisive action. This test can be systematically applied only by a specially qualified veterinary surgeon.

4. These are the most urgent and important parts of the action which may be taken by the Local Authority consequent upon this Report. As regards *popular instruction*, the first step is taken by the wide dissemination of the Report itself. The further step of issuing popular leaflets to be systematically distributed from house to house, and otherwise put into the hands of those responsible for the care of the sick. may be remitted to the Medical Officers to be taken in due course. It will be judicious to delay for a few months, so as to derive from the general attitude of the medical profession and the public, some guidance as to the scope and general character which it may be expedient to give to those popular directions.

5. It is scarcely necessary to point out that many departments of municipal management ought to be inspired with renewed energy, and to receive increased precision of direction,

each in its own special work, from this doctrine of tuberculosis, *e.g.*—

The Committee on Health, in the application of general and local powers to the suppression of damp, dark dwelling-houses; to the dissemination of light and air within and around tenements and workplaces, whether factories, workshops, warehouses, counting-houses, or offices; in the enforcement of ventilation, light, and cleanliness in byres; in the provision of open spaces and play places convenient to tenements.

The Magistrates Committee, in the suppression of smoke, and the energetic application of the law in all cases relating to overcrowding, cleanliness of the house, and other matters of domestic police, which, if not associated in the judicial mind with some large principle, are apt to sink to the rank of petty details, rather vexatious than otherwise.

The Parks and Galleries Committee, in the support they derive for the conviction that their parks are only useful in proportion as they are used, and that therefore they must be made attractive, and that the same attractions will not draw every class in the community. Flowers are wanted for some, music for others, but always space for the young. The youthful instinct to play and sport is accessory to growth and development, and this Committee may, by providing suitable space for the gratification of that instinct, powerfully aid in building up strong resistant constitutions in the youth of Glasgow.

The Committee on Sewage Works will see more clearly a hygienic sanction for their function in the prospect of sweetening the air, and transforming the Clyde from an offensive, repulsive sewer into an attractive water-way, on which he that fares will find wholesome food for his lungs, and which will be a temptation to one of the most useful recreations for developing their capacity, and thus raising the vital standard of the whole body.

The Committee on Tramways may find moral courage to enforce their bye-laws against spitting "in or upon any car," which, in fact, means to compel the male sex to refrain, for hygienic reasons, from doing that which the female sex, from a sense of propriety, never does.

The Dean of Guild Court will recognise the profound importance of its functions in the rigid enforcement of every item of the provisions of the law which virtually determine the health of the future in so far as it depends upon a dry foundation and walls, and upon the distribution of light and the free movement of the air in and around the dwelling, and not only there, but wherever human beings are employed in earning their bread.

6. The practical issues of this doctrine of tuberculosis, as regards the individual and the family, in matters which can only be touched by private effort, actuated by the growth of intelligence, are many and various, and must be trusted to the evolution of thought in the process of time. How to deal with *domestic dust* is, perhaps, the most important of these issues. It is to be desired that women should understand the importance of dust in the causation of Consumption, and should devise methods of dealing with dust which will end in its collection and destruction, not merely in its disturbance and redistribution. Tuberculosis confers hitherto unimagined dignity on tea-leaves! Not merely as housewives, but as sick nurses, women ought to study these modern doctrines.

MEMORIAL PRESENTED BY THE MEDICO-CHIRURGICAL SOCIETY OF GLASGOW TO THE COMMITTEE ON HEALTH, 25TH JANUARY, 1892.

TO THE HONOURABLE THE LORD PROVOST, THE MAGISTRATES AND COUNCIL OF THE CITY AND ROYAL BURGH OF GLASGOW, AS THE POLICE COMMISSIONERS THEREOF.

INFECTIOUSNESS OF TUBERCULOSIS.

The Medico-Chirurgical Society of Glasgow, a body consisting of over two hundred members, mostly Practitioners in the West of Scotland, held a discussion, and arrived at the following Resolution, at a meeting on the 18th December, 1891:—

> "That a Memorial be presented to the Town Council of Glasgow, calling their attention to the fact that tuberculosis is now fully recognised as an infectious disease, and asking them to take the matter into their serious consideration, with a view to the protection of the community from the infection."

A Committee was afterwards appointed to frame such a Memorial as would serve to indicate with somewhat more of detail the views and objects aimed at in the Resolution. We beg, accordingly, to submit to your Lordship, and to the Magistrates and the Town Council, the following considerations:—

1. Tuberculosis is an infectious disease, in the sense that in all cases of this disease the one constant and necessary element in the causation is a microbe. This microbe grows and multiplies in the bodies of certain animals and of man when introduced from without, and in so doing it produces an intensely active poison, which is the more direct agent in bringing about the morbid changes in the living structures. There are, doubtless, other elements in the causation, such as inherited and

acquired susceptibility, but the microbe is the only essential and constant one, and there is evidence to show that, without any special susceptibility, it may produce the disease if introduced in sufficient quantity.

2. As the microbe will not grow except at a temperature almost identical with that of the body, the living bodies of men and animals affected are the great propagating places of it. They are the sources of the supply, and constitute the centres from which the infection is derived. But the microbe is not retained in the bodies of the persons affected. Most of the forms of tuberculosis are characterised by discharges of matter from the affected parts of the body, and these discharges contain the microbe—often in very large quantities. The most frequent form of tuberculosis is Consumption of the Lungs, and persons affected with this disease almost constantly spit up matter which is loaded with the infective microbe. The spit of such persons when dry is liable to be pulverised into fine dust, and this, in its dissemination, carries the still living microbe with it.

3. It is believed that tuberculosis is fairly to be compared, as regards its infectious quality, if not with Typhus and Small-pox, at least with Typhoid or Enteric Fever, although the mode and channel of the infection may be so different as to make it much less obviously dangerous to live in the same house or room with a case of Consumption than it would be in the case of one of the well-known contagious fevers. Tuberculosis, however, is much more disastrous in its results than all the other infectious diseases put together. According to the Annual Report of the Registrar-General for 1888, the deaths registered as due to tuberculosis in Glasgow numbered 1824, and those assigned to all other miasmatic, that is, infectious diseases, including Measles, Scarlet Fever, Whooping-cough, &c., were 1089. For reasons known to us, it seems certain that the mortality from tuberculosis considerably exceeds that which appears in the Registrar-General's returns, but even these figures are sufficiently striking. The deaths registered as tuberculous made up 15.5 per cent. of the total deaths in Glasgow in 1888. These facts imply a large amount of what may be called " floating infection " in our midst.

4. The Town Council, by its action in prohibiting the sale of tuberculous meat and milk has, in our opinion, very properly endeavoured to grapple with one source of the infection. It may be said that the great prevalence of tuberculosis in cattle, especially in milk cows kept in town byres, and therefore both more likely to be infected with tuberculosis, and to become, in turn, sources of infection through their milk, has justly been already considered by the authorities. We recognise the

wisdom of a policy having for its object the removal of this source of infection, which is dangerous for man as well as for animals. It should be possible, by rigid cleansing and disinfecting of byres, and by the condemnation of all carcases or animals known to be tuberculous, to stop this source of infection.

5. It is not for us to prescribe the mode in which the infection should be dealt with in the case of man. The Council has skilled officials whom it can consult on the matter. But we venture to suggest that a beginning should be made with a definite attempt to stay the infection. If the public were authoritatively informed of the harmful nature of all discharges from tuberculous persons, and more particularly from cases of Consumption of the Lungs, and if they were encouraged to have these discharges rendered innocuous, and also to submit their houses and clothing to disinfection at intervals during the currency of the disease, and again at its close, it is believed that much good would result. With the splendid sanitary organisation which Glasgow possesses, it should be possible to do much to cleanse our city from some of the principal causes of the widespread prevalence of this, its greatest plague.

On behalf of the Society,

JOSEPH COATS, M.D., *President.*
W. T. GAIRDNER, M.D.
HUGH THOMSON, M.D.
JOHN LINDSAY STEVEN, M.D.
CHARLES WORKMAN, M.D.
J. WALKER DOWNIE, M.D., *Secretary.*

CHAPTER XI.

ON DISINFECTION.[1]

Gentlemen,—First let me explain the scope of this paper. I have dropped from the title the subject of Infection, and confine myself to Disinfection, which affords material enough. I have read pretty well all that has been written about disinfection—both theoretical, or experimental, and practical. I am familiar with the various so-called disinfectants and disinfectors as placed in the market, and pressed by travellers and advertisements upon the public. I have had a large experience of the practical difficulties in the way of the effective use, even of genuine disinfectants, in detail, in private or on the largest scale in public operations. I do not pretend to treat my subject scientifically. I propose to submit merely a few general conclusions which, during the observation and direction of the practice of disinfection in an extensive field for a good many years, have grown up in my mind. They are only the formulated impressions left by the multitude of facts which pass under the eye of a busy man, whose first duty is to get through a vast amount of daily work, and who has no time for that precise record of data which is necessary to a scientific disquisition.

If we begin the study of disinfection in the laboratory, the problem before us seems very simple. We learn there that if we take a certain contagium, which is definitely associated with a certain disease, if to a determined quantity of that contagium we add a certain chemical agent in known proportion, and after admixture and the lapse of a certain time, we introduce a certain amount of the mixture into the body of some animal, we find that the specific morbid process is not established; or if we attempt to cultivate it in some suitable medium it will not grow. The contagium has thus been disinfected, and we know that the chemical agent is a disinfectant under the conditions of the experiment. The same method applied to the use of heat enables us to conclude in like manner that a certain temperature maintained for a certain time is disinfectant, length of time compensating diminished temperature, and moist heat being more active than dry. Setting aside the fact that the number of contagia which can in this way be submitted to precise experiment is small compared with the number of diseases which have specific contagia, so that we are left largely to analogy in the application of such experiments to practice; there are other more serious difficulties which meet us in practice. Even supposing that all contagia had been subjected to exact experiment, and that we knew that under certain conditions obtained in the laboratory the specific energy of each could be destroyed, how are we in practice to control and secure these conditions? We have to attack these contagia in the whole environment and products of the patient. The media in which those contagia reside are innumerable, and as varied and opposed in their physical character as they are numerous. Even in the same medium the contagium varies in concentration, or quantity, and the same contagium, according as it is moist or dry, in seed or germinated, presents different degrees of vital resistance. The air, the excreta, solid and fluid, the bedding and clothing, the furnishings of the room, the utensils for the service of the sick, all are more or less impregnated with the contagium of the special disease. In each case there is a separate and different task before us, and the case changes with the disease. Even if we had nothing else to think of but the destruction of the contagium, the same disinfectant applied in the same way would not meet the physical necessities of each case. Still, the laboratory would seem to overcome this difficulty by supplying us with disinfectants adapted to the various physical conditions under which the contagia exist in each medium. We have gases for the air, a choice of solids and liquids for the excreta, solutions adapted for the furnishings, and heat, dry or moist, for the bedding and clothing.

---

[1] Read at a meeting of the West of Scotland Branch of the British Medical Association, held at Kilmarnock, 13th November, 1884.

But this mere necessary variety brings with it practical difficulties. Every single act of disinfection is a scientific process. There must be precision in use as to quantity and time, there must be unfailing uniformity, there must be perpetual vigilance to apply the exact process, either continuously, as in the case of aerial disinfection, or on each occasion when the dangerous matter is produced, as in the case of the abdominal excreta. In short, the sick-room must become a scientific laboratory, and that under the control of persons usually unskilled and even if intelligent, unless in the comparatively rare case in which a trained nurse is in charge, always with minds disturbed by solicitude, and in a condition as far removed as possible from the calm, cool domain of reason. As for the application of heat, as hitherto understood, that is beyond private resources. Certainly this is not the character of disinfection for the million, even if disinfectants could be had for nothing. On the contrary, they are all more or less costly, and when we consider the straitened circumstances which are most common in sickness, this element is in itself fatal to systematic effective disinfection on the lines of laboratory experiment

This criticism of disinfection from a laboratory point of view has hitherto gone on the supposition that in disinfecting the various media we have nothing to think of but the destruction of the contagium. This is far from being practically correct. What are these media? They are for the most part not like mere decoctions of hay, or cultivation fluids or solids, interesting solely from their vital and chemical relations to the contagia which they contain. They are either literally of vital importance to the patient, as the air which must at all risks sustain his life, or figuratively, as his property, possessed of economic value. The abdominal excreta may be left to the chemist to treat as he pleases, or rather, to be treated as the intelligence and means of his agents at the bedside will permit. But the air of the apartment must first of all be respirable; and if it is respirable, it cannot be disinfected. You may deodorise it by faint evolutions of chlorine or sulphurous acid, or dissemination of carbolic acid, or by the more aesthetic and agreeable aromatic vinegar, or eau-de-Cologne, or you may follow the fantastic suggestion of another author and moisten the heads of matches so as to liberate ozone! but this is the mere delusive ghost of disinfection. There is probably little harm done by saucers with chloride of lime placed about the apartment, or sheets soaked in carbolic acid draped over the doorway, or Condy's fluid sprinkled on the floor, or any other of these inane proceedings. The worst that can be said of them is that they may give a sense of false security, and divert attention from free ventilation and scrupulous cleanliness. The sensations of the patient and attendants will keep them within the limits of innocuousness. Still, they partake of the same character as much of the more serious public practice of disinfection which Simon has described as a "futile ceremony of vague chemical libations or powderings, . . . savouring rather of superstitious observance than of rational recourse to chemistry."

It is in the disinfection of bed and body clothing, mattresses, and the like, that the restraints of economic considerations upon the endeavours to attain theoretical perfection are most felt. Yet this is undoubtedly the department of disinfection which it is of the highest practical importance to carry out efficiently. I suppose at least 75 per cent. of all the contagia thrown off in our commonest infectious diseases is one way or another detained in those personal belongings of the patient. At any rate if this overstates the fact quantitatively, it certainly does not as an estimate of the risk of effective infection arising from the proportion of the total contagia conveyed to the bedding and clothing, as compared with that sent into the air or down our sewers. Therefore, we have to attack the most dangerous and insidious infectiveness lodged in personal property of the greatest value to the owner. It so happens that of all the disinfectants, that which is most applicable to bed and body clothing and bedding is also that which is experimentally proved to be the most certain, and under conditions, the best known and the most easily controlled—viz., heat. All contagia are destroyed by boiling, and a dry heat of 230 deg. F., or even 220 deg. F., maintained for a longer time, is equally certain in action. Yet it is also true that this disinfectant is the most difficult of all to apply without injury to the textures submitted to it. The material is derived from many sources, animal and vegetable, and varies, therefore, in power of resisting heat. The value of the manufactured article depends sometimes on form and elasticity, which may be lost through heat, or on colour, which may be impaired. Every one knows that blankets and other woollen articles cannot be boiled without serious injury. Even the most cautious washing changes gradually the white, fleecy, new blanket into the yellow, dense, bare, comparatively comfortless old one. With cottons and linens there is no trouble. They may be boiled with impunity. Wool, hair, and feathers are most troublesome. They all depend, for their value and utility, upon form and elasticity, which again depend not only upon the hygrometric moisture, but upon the presence of animal fats. When we begin to deal with such articles, we find that we are involved in all the technical knowledge of several trade processes. If you wish to realise the truth of my words, read pp. 497-508 of Vallin's *Traite des Disinfectants et de la Desinfection*, the most recent work on the subject of which I am aware, and one which is pervaded by a minute practical knowledge and common sense which are unique in their application to this branch of sanitation.

In short, then, in the application of all processes of disinfection to articles of value, we are controlled and guided not by considerations of what is theoretically necessary, but by the effects of our processes upon the articles in question. And to whose judgment must these effects be submitted? We have the guidance of many and valuable experiments, as to the limits within which we may avoid discolouration, increase of friability, loss of elasticity, diminished resistance, and lowered breaking point of fibre. But we are not judged by scientific men like Ransom, De Chaumont, or Vallin. Our judges are women and exacting householders, generally backed by the opinions of upholsterers, hair and feather cleaners, and the like, who entertain a secret grudge against sanitary intrusion into their technical domain. It does not avail to quote Ransom as against the judgment of a housewife, who detects that her blankets are returned a shade yellower than they were when they left her custody. Dynamometric experiments on the breaking point of wool or hair fibres will not avert the claim for damages which is supported by the fact that the upholsterer charges so much for the wool or hair necessary to make up the original weight of a mattress or a pillow. The practical result is constant friction in carrying out disinfection, temptation to public officials to scamp the work to avoid censure: constant private efforts to escape interference by concealment, or appeal to fictitious domestic processes; or, on the part of the wealthy, to resort to the general cleansing and renewing operations of the upholsterer and hair and feather cleaner.

Is there any way out of these practical difficulties, any method of simplifying our conceptions of the general requirements of disinfection, so as to substitute a lower standard which we may reasonably expect to maintain in place of a high one, which we know in practice will never or seldom be acted up to? It is instructive to take formulated codes of disinfection of recent date, such as those issued by Central Sanitary authorities, or for the armies of different countries, and observe how they meet the practical difficulties of which I have spoken. They represent the essence of the wisdom of these countries as applied to the solution of those difficulties. In the case of military codes, the property is treated by the owners, who have absolute control over its disposal, and it is treated by subordinates under the strictest discipline. Yet, even in these circumstances, Vallin says, and says truly, "If we wish disinfection to be practised, we must simplify the operation to a maximum, so that it may become habitual, daily expeditious, and may not deteriorate the material entrusted to the care of the administrative officials." The French Army Hospital regulations are very simple. Everything that can be washed is washed, but with unusual thoroughness. After a first washing, the articles are steeped in pure water for 24 hours. Next day they are again washed, each article being taken separately, and scrubbed with Fuller's earth, then rinsed in clean water and dried. *Finally*, they are fumigated with sulphur, and hung out in the open air. The wool of beds is similarly washed and soaked; but in the place of a second washing, it is passed through an alkaline solution to restore elasticity, dried and fumigated. In the English Army regulations, the disinfection "by dry heat or any other means" precedes the washing; but such articles as cannot be washed are to be fumigated, exposed to air and sun for a week, beaten and brushed. Hair mattresses are to be exposed to the air, beaten, and, if possible, subjected to dry heat of not less than 212 deg. for two hours. In "Instructions for Disinfection," issued by the "National Board of Health," of the United States, after a startling instruction to boil "flannels, blankets, &c.," in a solution of sulphate of zinc and common salt for at least half-an-hour,—they proceed: "Heavy woollen clothing, silks, furs, stuffed bed-covers, beds, and other articles which cannot be treated with the zinc solution, should be hung in the room during fumigation, pockets being turned out, and the whole garment thoroughly exposed. *Afterward they should be hung in the air, beaten and shaken.* Pillows, beds, stuffed mattresses, upholstered furniture, &c., should be cut open, the contents spread out and thoroughly fumigated. Carpets are best fumigated on the floor, *but should afterwards be removed to the open air and thoroughly beaten.*" In certain regulations issued quite recently by the State of Illinois for the prevention of small-pox, there is a still more pronounced appeal, after every sort of technical process of disinfection to ordinary washing, to exposure to sun and air, and to beating and shaking of articles which have received some dry treatment. It is especially noted that no security is to be obtained but by free exposure to the air of every garment which has been exposed to infection; and that after fumigating an apartment it must be left empty; with every door and window open for a week or a fortnight, and all the furniture, if possible, placed in the open air.

These are but illustrations from the highest sources of what meets one in any attempt to codify and regulate disinfection on a large scale. In all, two facts are conspicuous: (1) That either in conjunction with technical processes of disinfection or as a sort of last resource when these are inapplicable, recourse is had to the free use of the great natural disinfectants —open air and sunlight. If these are enjoined as sequents to technical disinfection, there is displayed a want of confidence in that disinfection; if these are substituted, then it is obvious that they must be held to be sufficient alone. In either case aeration and insolation are either sufficient or insufficient by themselves. If the former, why not be satisfied with them? If the latter, why enjoin them? (2) The other fact is that what we shall, for the present, call nothing more than *mechanical* disinfection, also forms either an adjunct to or a substitute for all the ordinary technical processes. The contagia are removed by the common process of washing with soap and hot water, by beating, shaking, brushing, and rubbing surfaces with damp cloths or soap and water, all of which are simply ordinary operations in domestic cleansing.

I feel that I am becoming very heretical, and that my heresy will, like all heresies, become dangerous if half apprehended, or, through imperfect expression, misunderstood. I know that *perfect* disinfection means killing the contagium before getting rid of its material substance. To take a shovelful of small-pox crusts and throw them into the ashpit, or to shake the debris from the flannels of a scarlatinal convalescent over the window sill, are not processes of disinfection. In a sense you disinfect the room which has been swept and the flannel which has been shaken, but you start the contagia on a fresh career of mischief. You must adapt your procedure to the case in hand. You must burn the small-pox crusts in the fire, and you must simply wash the flannel in the ordinary way with soap and a plentiful use of water. It is of no use fumigating it. Let us follow out this process of washing. I believe that the contagia, though in their naked condition microscopic, or probably as spores, sometimes minute beyond the powers of any microscope, are as they leave the body comparatively gross, wrapped in faecal envelopes, in effete animal matter. They are, in short, physically associated with dirt. It may be microscopic, as in the case of the breath and urine; or minute, as in the case of the finer debris of the skin; or tangible, as in the case of the discharges from the alimentary canal. Their inherent vitality and longevity are proportioned to the associated moisture. What Baxter thought was probable many years ago, I believe is certain, "that all contagia disappear sooner or later under the influence of air and moisture." The contagia which impregnate the breath are moist, and if they float out into the open air their career as living forms soon terminates. So with the cutaneous exhalations. Hence typhus, which spreads like wildfire, with personal uncleanness and overcrowding, is absolutely disarmed by cleanliness and ventilation alone. The contagia of the urine and fæces are still more moist, and so farther on the way to destruction at the outset of their career. If their moisture is rapidly evaporated, so that the solid ingedients become dust, then they are endowed with the longevity and far-reaching infectiveness of all dry contagia. The most dangerous and long-lived of all contagia are those which begin their external career in this state of dryness; of these scarlet fever and small-pox are the most striking illustrations. They impregnate the atmosphere of the room, and make it highly infective. Yet we can do nothing to destroy this infectiveness, but trust to the natural disinfectants—air and moisture—which, in this climate, any hygroscopic body soon acquires. We may, however, by applications to the patient's body, clog the wings of the contagia, and retain the debris to be removed by the bath. In the water all contagia are drowned at once, in the sense of being imprisoned, and if the bulk of water be sufficiently large in proportion to the organic matter, decomposition proceeds apace, and they soon cease to exist as vital entities. There are only two circumstances which may give them another opportunity of infection, one is if they contaminate the water supply, the other is if from defect of bulk of water and stagnation gaseous bubbles project them into the air, or the filthy solution smears the sides of sewers above water level, or deposits mud which is exposed to the sun and the sweep of currents of air.

Let us return now with these ideas in our minds to washing regarded simply as a mechanical process of disinfection. The contagia in a washable garment are bulky from their attachment to animal debris. If we take a new sponge, by continuous washing in water we get rid ultimately of every particle of sand. If we take a sheet, for example, or a blanket smeared with the pus of small-pox, and, carrying it to a freely-flowing stream, soak it, beat it, rinse it back and forward in the stream; wring it, and again immerse, and so proceed for a sufficient time, there can be no doubt that ultimately we shall completely disinfect it. The pus and variolous contagia will flow down stream, and be effectually disposed of by dilution and oxidation; and by the mere mechanical use of water the article is disinfected. This is the rudest form of washing. The ordinary process, I need scarcely say, is even mechanically much more efficient. The element of heat also comes into play. In any degree, with the added soap and soda, it promotes the solution and thorough moistening of the animal debris, strips the contagia, so to speak, of their protecting envelopes, and initiates the final process of destruction. If the nature of the tissue to be washed permits boiling, then we have perfect disinfection, as no contagium survives a moist temperature of 212 deg. F. Therefore, whenever we can subject any article to the domestic process of washing with boiling, we can perfectly disinfect it.

So much by way of reasoning on general principles in proof of the efficiency of simple washing as a disinfecting process. I am able to establish my opinion from the experience of many years, during which this has been the sole method of disinfection applied by the Sanitary Department of Glasgow to all washable articles. We have during the last ten years washed in the same washing-house over a million of articles of every sort, infected by every variety of contagium known in this country. Everything has been done exactly as any good housewife would do it, only in a place provided for the purpose, and with ample supply of water and steam, and recently with mechanical aid. Blankets and woollen articles have not been boiled, all others have. The most crucial fact is this, that there has never been a single case, or suspicion of a case, of interchanged disease, *e.g.* of small-pox, appearing in a house from which clothes had been removed on account of scarlet fever or typhus. In short, I am convinced that in every case the result was obtained for which the operation of washing was undertaken. The only defect is this, that the washerwomen must handle the articles before disinfection or drowning of the contagia in water, and therefore are occasionally infected. To overcome this difficulty, we lately had erected an apparatus to disinfect by high pressure steam before disturbing the bundles; but this at once brought about complaints of injury to the clothing, which would soon have wrecked our popularity with the housewives and obstructed our operations. We found that the steam fixed all sorts of stains from animal matter. A sheet stained with blood comes out a dull red colour which nothing will remove. Indeed, this application of steam is a part of the trade process of dyeing. Every woman knows that cloth stained with blood must be steeped and rinsed in cold water before ordinary washing. The practical result is, that dirty clothes must be disinfected by washing before being disinfected by steam or dry heat, for that also fixes stains. We are, therefore, again disinfecting all washable articles by simple washing.[1]

In spite of this ample experience, in view of the salamander-like behaviour of spores in resisting dry heat, according to the experiments of eminent biologists, it was with a sense of relief that, two year ago, I read the papers of Koch and Wolfhugel, on the comparative disinfecting value of dry heat and steam. They were asked to advise the Government as to the best form of disinfecting apparatus by heat. By experiments of such convincing accuracy as might be expected under such guidance, they proved that, by direct application of steam at 212 deg. F. for five to ten minutes, even the virulence of dried anthrax blood was destroyed. Earth spores, which have a reputation for tenacity of life at high temperature beyond all others, were devitalised by fifteen minutes' exposure to steam, while they resisted the action of dry heat continued for three or four hours at 302 deg. F. Koch proved also that the penetrating power of steam, even at atmospheric pressure, was immensely superior to that of dry heat. He therefore reported that, whenever heat can be applied to disinfection, there is no method equal to the use of steam, applied so that it may reach the articles to be disinfected at its initial temperature 212 deg. F. The boiling point of saline solutions is higher than that of pure water, *e.g.* 30 per cent. of common salt raises the boiling point to 224 deg. F. Nitrate of potash and chloride of calcium raise it much higher. The dry heat stoves in Berlin have consequently been reconstructed for the application of steam; and I believe that in Paris the municipality is now effecting the same change in the district disinfecting stoves of that city.

---

[1] The apparatus referred to is that invented by Washington Lyon.

It must be observed, that, though washable articles are so easily disinfected, the process must be carried out either in a private washing-house, or in a public washing-house, devoted solely to that use. Wherever it is done there must be abundance of water, both hot and cold. Therefore, the use of washing-houses which are not private is not permissible; and, in the hands of a slovenly person who makes a puddle of her washing-tub, still more of one who has no tub and no appliances, no washing can be efficient for disinfecting.

As to hair and wool, I am satisfied that mere mechanical disinfection with cold water and soap, which would not remove the natural grease and so impair the material, is thoroughly effective. There must be a constant flow of water, and a thorough disturbance and agitation of the fibres. After this process and washing of the tick, the whole can be sent to an upholsterer to remake.

Any article which is impregnated with dry contagia need not be fumigated, even if the tissue will resist corrosion or the colour not be cast. We cannot have confidence that any gas will penetrate the dry organic envelopes. Our only resource again is mechanical—beating, shaking, brushing, with exposure for as long a period as possible to the free circulation of air and direct sunlight. In populous places this cannot be done at the domicile with safety. In the country it may. Carpets are the chief representatives of this class of articles which come into our hands. We have a carpet-beating machine, which is ventilated into a furnace, to which all dust is conveyed. Afterwards they are dragged over the grass, and hung up in the open air for a time. In the case of mattresses, pillows, and the like, which are not visibly soiled, we employ steam disinfection, which is also useful in the treatment of clothing of good quality which is not soiled, or which cannot with safety be washed.

Chemical disinfection of the abdominal excreta, as usually practised, I believe to be all but valueless. However accurately you have determined the efficient proportion of the agent to be used, what can you expect from passing the excretion into the solution or powder, or putting the solution or the powder on the excreta, and the next minute drenching the whole down the water-closet? How can the agent, while in due proportion, have penetrated the fæcal masses and killed the contagia if we drown it at once in water? In order to meet this difficulty, I had water troughs substituted at Belvidere for ordinary water-closets. These I intended to fill with a 1 to 15 mixture of strong muriatic acid and water, which would be renewed morning and evening. On calculating the annual cost of this procedure, I found it could not be done for less than £500 a year, for a daily average of 150 patients; not to speak of the difficulty of arranging for the safe distribution of such a quantity of corrosive acid. I therefore abandoned the project, and use cupralum in such quantity as will at least keep down the odour. As an endeavour to disinfect fæces on a large scale, I cannot say my experience is encouraging. Use anything you please, but expect only deodorisation, and get rid of the faecal matter into the sewers or into the earth without delay. When thoroughly immersed in water, it is harmless for the present, and an oily pellicle, as of terebene or paraffin, hermetically seals down the contagia.

As to apartments which have been occupied by a patient during an infectious illness, you may fumigate if you will, but a thorough domestic cleaning is the best mode of disinfection, renewing wall-surfaces, which are dirty, washing down paint, rubbing up furniture, burning all dust, and letting the air play freely through the open doors and windows as long as possible.

I believe that the municipal disinfecting apparatus of the future will be a large washing and cleaning establishment, comprising in its various departments, besides a washing-house, provided with the best mechanical aids, a hair and wool-washing and feather-steaming, and carpet-beating apparatus. The processes to which the various articles and materials are subjected in cleaning, as presently carried out as ordinary businesses in towns, are all disinfecting. They merely require to be transferred to places set apart for infected goods outside the inhabited area.

In isolated houses in country districts, it is quite possible by a little ingenuity in arrangement, and fertility of resource in applying the principles which I have been inculcating, for country people to consume their own smoke. I have sometimes thought when besieged, by my friends the rural practitioners in the West of Scotland or their patients, with applications to receive infected washings, or to send out disinfectors to them, or still more, when, as occasionally happens, I intercept consignments of infected bedding at the upholsterers in Glasgow, that they might, without much difficulty, help themselves. I trust that out of this long and rather incoherent paper they may be able to pick some hints which will be of use in aiding them to do so. I shall always be glad to advise them how to meet special circumstances, and to enforce their advice with such weight as my opinion may possess in the event of that advice seeming, as it very possibly may seem to their clients, too homely, not sufficiently redolent of the popular notions of disinfection as an abstruse and mysterious art.

THE PHYSICAL LAWS WHICH GOVERN THE DISTRIBUTION OF INFECTION.[1]

During a course of reading recently undertaken in furtherance of an inquiry into the prevention of tuberculosis, my attention was attracted to the fact that the modern doctrine of tuberculosis rests upon physical laws of the operation of which the circumstances of infection with the bacillus of tubercle are but an illustration—very striking, and, as it happens, peculiarly capable of experimental demonstration—but, still, only an illustration or example. I learned that the bacilli of tubercle were imprisoned in the expectoration, and could not leave it while it continued to be moist. I asked myself, Would any kind of bacillus or microbe not, vulgarly speaking, be in the same box if similarly circumstanced? I learned that there were no bacilli in the breath of consumptives. I asked myself, Are there *ever* any microbes in the breath? I learned that although the breath of persons suffering from consumption was pure, yet the air about them became full of infective dust—*i.e.* dust containing bacilli, and that the source of this dust was their expectoration smeared about on handkerchiefs or otherwise dried and pulverised. I asked myself, Would the same result not ensue with any moist infected material similarly treated? These thoughts expanded into a consideration of the physical laws which govern the distribution of infection. The subject is a wide one, and within the share of your time which I can reasonably ask even the outlines of an adequate discussion can only be suggested. But the doctrine of infection is so distinctly germane to the business of the Section that any part of it seems to be a proper subject for the address with which the President is expected to open your proceedings and to introduce himself to your acquaintance.

---

[1] Address as President of the Preventive Medicine Section, Glasgow Congress of the British Institute of Public Health (now Royal Institute of Public Health), 1886.

It has long ceased to be disputed that infection has a material basis, that the quality of infection is inherent in a material *substantia*. Positive knowledge now covers such a considerable proportion of the infectious diseases that I am warranted in filling up by analogy the gradually diminishing gaps, and asserting broadly as the doctrine of infection, that its *substantia* is always a microbe—an organised solid. For the present I propose to consider the contagia merely as solid bodies. The possession of the complex quality of life brings them into new relationship to such physical agents as light, heat, moisture, electricity; and profoundly influences the bearing of gravitation, cohesion, and other laws of matter as matter, upon the effective working out of their functions. But in the investigation of the circumstances under which outbreaks of infectious disease occur, in the routine operations about the individual case to prevent infection during its currency, and to remove infection from its environment at its close—in short, in the daily work of preventive service, it is of importance to rise to the conception of a few absolute and universal laws; and, having done so, to apply them rigidly in the interpretation of observed facts, and in the guidance of procedure. There is no property of the contagia from which we can rise to generalisations more widely applicable to the phenomena of infection, more interesting and more useful, than that of solidity. Whatever their form, whatever their size, whether spore or mature organism, whether moist or dry, whether they are naked or embedded in fragments of the material in which they grew, whether they grow with or without oxygen, whether they are wholly or partially parasitic, being solids, we can, without hesitation, predict how they will behave in certain circumstances, in which their behaviour is of supreme practical importance. Let us begin with the consideration of an infected liquid. Within the limits of the liquid the automatic power of locomotion possessed by a few microbes is of no practical importance. They are borne passively in the internal currents so long as the fluid is agitated. They are not uniformly distributed. They exist in shoals. When the liquid is quiescent they subside with a rapidity proportioned to the relation between their own specific gravity and that of the liquid. It is difficult to compel our minds to apply to a particle of matter which is not only invisible to the naked eye but beyond the range of the microscope, the same physical laws as to a pea or a marble. Yet Tyndall has demonstrated by optical tests that particles so fine as to be ultramicroscopic and incapable of being caught by one hundred layers of the best filter paper, still own their allegiance to the law of gravitation by subsiding, though, as it were, reluctantly, "after a few weeks' quiet." Even these particles can be caught mechanically in the finer meshes of a porcelain filter.[1] The contagia, compared with such particles, are gross bodies. Here it may encourage in the popular mind that confidence in the application of physical laws which supports the man of science in his inferences, to say, with reference to the entire deportment of the contagia, regarded merely as solids, in gases (air) as well as in liquids (water), that this deportment has been proved to attend sub-divisions of matter far beyond the lower limit of their bulk.

The relation of infected liquids to the process of infection is of superlative importance. Contagia are passive. A fly alighting on a foul liquid may rise therefrom and transport microbes to a congenial soil, but the microbes are not auto-motors. They only move when they are moved. Can they be moved by evaporation? The daily operations of the chemical laboratory answer—No. The chemist evaporates down his solutions of non-volatile salts and never loses even a molecule. Distilled water contains no particles. It has been proved by experiments, oft repeated by different hands, that microbes cannot leave a liquid surface by evaporation; not even when foul-smelling gases arise with the watery vapour. I am content to rest upon the ordinary experience of the chemist. He conducts his evaporation at a temperature much higher than that at which, in nature, infected liquids are evaporated especially within inclosed inhabited spaces and from our own bodies. If ever by such means solids could be lifted from a liquid surface he would have discovered it. Although in a calm day the sea does not give to the air a single molecule of salt, we know that in storms the wind becomes charged with spray, and a white deposit is visible on windward-facing windows far inland. This observation points to the only circumstances under which a liquid can give up solids to the air. When gas is being formed in volumes, as in the case of rapid decomposition beneath the surface, then the resulting bubbles rise, burst, and may scatter particles into the air. These may be caught up before they can fall back into the liquid and be borne along by atmospheric currents. This may take place in a quite limited collection of fluid. If we have any wide area of infected water, as in a river or pond, sufficiently extensive to admit of agitation into waves before a gale, we may then have an infectious spin-drift borne along from the surface. A foul river falling over a weir or running down a rapid may toss up an infectious spray. These, however, are but the rare incidents which might liberate microbes from liquid. Barring such incidents, microbes submerged are imprisoned. Evaporation is equally powerless to raise solids into the air when it takes place from moist substances or surfaces. Solids and liquids are mingled to all degrees of consistency, but whether the water predominates, or whether the mass is pultaceous or stable in form, the watery vapour can be driven off by the application of heat, and the matter, in so far as it is not volatile, can be desiccated, and still not a particle or even a molecule takes wing. The chemist trusts to this in his analytic work every day. Moist substances or surfaces may be loaded with microbes, but mere evaporation will not raise them into the air.

---

[1] *The Floating Matter of the Air*, p. 97.

Yet, as everybody knows, the air swarms with microbes in the strata nearest the sea level, in populous places, and they are most numerous in overcrowded rooms. Among these, and in the dust of those localities, we recognise individual microbes which must have somehow got free from liquids or moist substances. The bacillus of tubercle is a typical example. It abounds in the environment of the consumptive, in the air and in the dust. It is not in the breath, it is not in the dusty exuviæ of the skin. It abounds in the sputum, but the sputum is not merely a moist but a very viscid substance, and until it dries and is broken up into dust can yield nothing but watery vapour to the air. If we wish to dry any substance we spread it out. We ted our hay. This viscid sputum smeared upon the folds of handkerchiefs soon dries. When dried it is mechanically broken up by every rearrangement of the folds, and the restless air bears away the infective particles, which pursue their amphibious existence—now afloat, attenuated and invisible; now stranded, aggregated and visible dust. *Mutatis mutandis;* this is the intermediate stage through which all microbes contained in liquids, or moist substances, or on moist surfaces, must pass before they can infect the air. In consumption it is the viscid sputum which must be evaporated to dryness and reduced to dust. In other diseases, according to their nature, it is the sputum, the evacuations from the bowels, from the "rice-water" of cholera through all the degrees of consistency, the urine, the ejected contents of the stomach, the tears, the perspiration, the viscid sputum from the lungs, the watery sputum from the mouth, the perverted secretions of other mucous surfaces. If you consider the physical properties of these infected substances you cannot fail to remark how varied they are, and how those varieties facilitate or obstruct the mechanics of aerial infection. The general law of these differences is very simple. Take the least complicated case in which minute solids may be involved in a liquid—viz., in distilled water. Imagine a film of this spread over a horizontal impervious surface and exposed to the sun. When the water has evaporated, each minute solid will be left lying upon a surface over which it is free to move with the impulse of the slightest air current, or from which it may roll when the surface is made vertical. Contagia are in these circumstances at once yielded to the air as dust. If our minute solids are involved in solutions of crystalloids, evaporation leaves them fixed in a layer of solid matter which keeps them stable but which is brittle and readily crumbles into dust. If again, they are involved in solutions of colloids, they part with their water less readily, and they remain included within a cohesive mass which must be tedded out before it will dry, and which, even when dried, becomes dust only under severe mechanical treatment. It is unnecessary for me to occupy your time applying these hypothetical cases to the constitution of the various secretions and excretions of the body. They all are more or less of the nature of colloids—those originating in mucous membranes more, and those in the skin and kidneys and lachrymal glands less. The cutaneous exuviæ begin as dust, and the cutaneous secretions being spread over an extensive evaporating surface, pass necessarily and at once into dust.

The case of the breath as a medium for the conveyance of infection is so special and so important as to demand separate consideration. It is the popular medium. It is to the breath we all turn with a natural and reasonable suspicion the moment we discover that the air surrounding an infectious person is infected. Yet if we scrutinise the circumstances in the light of the laws just expounded, we shall discover that we are entirely mistaken, and that the conditions under which the contagia pass to the air directly from the mouth are rare and accidental in their occurrence. There have been many experimental demonstrations that in the natural breath of health there are no solid bodies. The very latest is contained in a report on "The Composition of Expired Air and its Effects upon Animal Life," by Drs. Billings, Weir-Mitchell, and Bergey.[1] Their conclusion on this point is the following: "In ordinary quiet respiration, no bacteria, epithelial scales, or particles of dead tissue are contained in the expired air. In the act of coughing or sneezing such organisms or particles may probably be thrown out." The fact is that the mouth and air passages are a perfect illustration of my general statement that moist surfaces do not give off solids either by evaporation or under the influence of air currents. Here we have a complicated air-surface, which in health is kept perpetually moist, which is covered with microbes either borne in with the air and left sticking there, or as in the cavity of the mouth, finding there an appropriate habitat and breeding place. Yet when means are taken to free the inhaled air of all solids, the exhaled air is found to

[1] Smithsonian Institution, Washington, 1895.

contain none. Such is the condition of matters in health; and unless disease alters the physical circumstances, the breath must continue to be germ-free. Apart from the mechanical expulsion of particles by such acts as sneezing and coughing, what we have to contemplate is such a change of those physical conditions as will tend to the production of dust in the mouth. The febrile state parches the mouth and tongue, festoons the palate with strings and films of agglutinated mucus, covers the teeth with sordes; but even so we have to deal with colloidal matter, and I believe it must rarely, if ever, happen that the out-going breath will carry with it more than the gases of putrefaction. Very different, however, is the result when a handkerchief is used to cleanse the patient's teeth and tongue, or when the patient coughs or splutters over his bed-clothes, or if, as I have often seen in the malignant Typhus of olden times and in the Small-pox of to-day, impelled by a sense of suffocation he pulls the shreds of mucus from his throat and smears them upon any convenient material, or casts them upon the floor. These incidents bring us into line with the observations regarding consumption, and add to the great body of evidence in favour of the broad proposition that when air is infective it has been made so by the formation of dust; not directly through the medium of the breath. I need hardly say that the aerial infection which surrounds Typhus and Small-pox originates principally in the skin.

Your time will not permit me to follow those simple and elementary physical laws in detail into all the ramifications of their application. If firmly grasped they will be found not to be mere pious opinions, but clear lights to our path in many circumstances of difficulty and danger. Whenever there is reason to believe that a disease is infectious through the air, look to the conditions under which the specific discharges from the patient may be evaporated and desiccated, not to the breath. If you turn to Dr. T. W. Thompson's contribution to Stevenson and Murphy's encyclopædic work on Hygiene, "The Natural History of Infectious Diseases," you will find this regarding Measles: "The poison of Measles is held to be given off by the breath and mucus, possibly also by desquamating cuticle, though this is less certain. The recipient is no doubt, as a rule, infected through the respiratory tract." (Vol. II., p. 262.) In a previous sentence Dr. Thompson states that the poison of Measles is probably a micro-organism, although it has not been detected. I believe it is most probably a non-spore-bearing microbe. The breath cannot be infectious, unless momentarily after the explosion of a sneeze or under the impulse of a cough. As for mucus "giving off" the poison, it is impossible. But the secretions from the mucous membranes of the air passages, especially from the nose, and from the lachrymal glands, are so copious, so watery, and so smeared and distributed over bed and body clothing and handkerchiefs, that between the production of dust and the conveyance of the material itself by crude contact in the indiscriminate intercourse of childhood, I have no difficulty in accounting for the energetic infectivity of Measles in the catarrhal stage. So with Mumps—Dr. Thompson tells us: "The infection is believed to be given off by the breath" (p. 293). Although in Mumps the secretions of the mouth are vitiated it still presents surfaces to the breath as moist as in health and just as incapable of "giving off" anything of the nature of a solid to the out-going air. You will find in this article numerous references to the breath as "giving off" infectious matter, and in the light of the physical laws which we have been discussing you will be able to satisfy yourself that it can only do so on rare and easily recognisable occasions, and that if the air is habitually infective it is made so by desiccated liquid discharges or cutaneous exfoliations.

These laws have a very direct bearing on our interpretation of sundry phenomena of infection, and consequently upon preventive precautions. If you find evidence that a disease, say Scarlet Fever, or Diphtheria, has taken up its residence—so to speak—in a room after the patient has left it, look for your enemy under the disguise of dust. If you hear of washerwomen being infected, ascribe it to the dust of the soiled clothes, given off in their sorting and distribution previous to being washed, not to microbes being borne up in their faces with the steam of the washing-tub. Indeed, take it as a universal rule, the remembrance of which may confer great peace of mind where vague ideas of infection would tend to hysterical excitement, that microbes under water, or involved in a thoroughly damp substance, are scotched if not killed. We can look at the liquid with equanimity. It may stink, and if we are foolish enough to keep it beside us, it may depreciate our health; but unless we soil our hands with it, and so convey it to our mouths, or pour it out within the drainage area of our wells and drink it, or dip a sheet in it, and dry the sheet and scatter the dust within our breathing area, it cannot infect us. So with the damp substance. It will sooner reach the condition of dust than the liquid; but, until, then, it is innocuous. The inference is a very obvious one, that if the contagia are so effectually drowned and put beyond the possibility of doing harm when either damped or immersed in a mass of liquid, then we have in this expedient the readiest way of making them temporarily innocuous. If mud is harmless so long as we prevent it from becoming dust, then, if, whenever we encounter dust we make the dust again into mud, we shall make it again harmless. This is the principle upon which the Bradford manufacturers deal with that most virulent and typical dust disease, Anthrax. Before being disturbed, the bale of foul hair is carefully immersed in water; it is allowed to soak, and the bale is loosened out so that the water may gain access to the very heart. The workers are not allowed to touch the hair until the bacillar dust is wet, and they are required to tease and sort it out while it is damp. In this way the dust is turned into mud, and this dangerous process is conducted in safety. In like manner if, instead of pitching infected clothing and changes of bed linen into the dirty clothes basket, where moist stains soon become dry; if, instead of tossing infected articles about on every occasion of handling them, we disturbed them as little as possible, and quietly and promptly plunged them into a tub of water, we might take our leisure about future processes. The infection is harmless not merely so long as the articles are beneath the water, but after they are wrung out of it, so long as they are damp. As to the infective flotsam and jetsam of the air, the dust of apartments which have been inhabited by the infectious sick, I remind you of the principle adopted in the construction of hospital wards and operating theatres—viz., to have as few horizontal surfaces as possible; to have them as smooth and hard as possible, and to make the whole interior of such material that every part of it can be thoroughly hosed down at will. This is again the process of making dust into mud, and if we spray the water through the air we merely imitate one of nature's processes for atmospheric disinfection—the rain. Dust and air infection are reciprocals. The air of a room may be disinfected by simple subsidence. It has been suggested as a part of the process of disinfection of apartments to shut up all doors and windows and keep the air quiet for twenty-four hours.[1] Yet *the room* is not thus disinfected. You must quietly capture and drown the dust. If you throw open doors and windows, toss about bedding, move furniture, bustle over the place with whisks and dusters, you merely chase the dust about and re-infect the air. I speak of dust in closed, inhabited spaces. In the open air that part of the dust which is living and dangerous need give us no further anxiety. Sunlight and rain will soon destroy it or drown it.

I think this is the first time I have used the word "disinfection" in this address, and you will observe I applied it to a process which does not kill the microbes, but simply lands them where they will do no further harm—in the gutter. On the same principle I did not say that you should soak infected clothes in a 5 per cent. solution of carbolic acid, or that you should spray your walls with a solution of 1 in 1000 of bichloride of mercury. I merely advised you to plunge the clothes in a tub of water, and to hose the walls with water. It seems to me that in dealing with infected liquids and with substances which are moist or can be moistened, we simply waste time in attempts to disinfect which are not only unnecessary but will, in all probability, prove futile. This is eminently true as regards everything of which the final and fit destination is the sewer. Nothing interested or delighted me more in all my reading regarding tuberculosis than the following passage in the report of the experts consulted by the Prussian Government :—" The spittoon is to contain as much water as will not readily spill. The question which is frequently raised (as in the debate at Munich), whether the contents ought to be disinfected before being emptied out, we may answer in the negative. Chemical agents touch the masses of sputum only from the outside, merely coagulate the albumen and penetrate no further. Boiling would be certain, but difficult to carry out. Therefore there is nothing to be done but empty it down the drains or into the water closet, where the sputum remains moist, and, therefore, harmless." In questions of chemical disinfection, Tyndall's account of Schultze's experiment with air drawn through sulphuric acid in order to free it of germs and also kill them, always comes to mind. Tyndall shows that unless the air is passed very slowly through the acid many germs inside the air-bubbles never come in contact with the acid ; and if the air is so passed, he remarks :—" Water will be found quite as effectual as sulphuric acid. . . . The germs were not killed by the water, but they were effectually intercepted " (*Ibid.*, p. 281). The success of all laboratory experiments on the chemical destruction of microbes evidently depends upon so many conditions that failure in practice either on the large scale of public use or in the unskilled hands of private persons is certain. At least, success is uncertain, and confidence without justification may lead to disaster. Therefore, I say if discharges are fluid or moist to begin with get them by the shortest route into the sewer. Dust as dust is invulnerable. If you have to deal with dust turn it into mud and send it also to the sewers. I have no fear that any sort of disease-producing microbe after it once reaches the sewers will ever turn up alive again. Of course, if your sewers discharge into a potable river or your drains leak into local wells, you must take the consequences. All that can be said is that a few germs more or less will in that case make little difference in the results. Otherwise, for pathogenic microbes the sewer is the broad road which leads to destruction. They speedily perish amid the antagonisms, rivalries, and incompatibilities of nature, which after all are more deadly than all the purposive efforts of man. Imperfect chemical disinfection not merely fails to kill the microbes but it interferes with the operation of the organisms of putrefaction.

---

[1] Du Role et de l'Importance de la Sedimentation des Germes atmospheriques," par le Dr. J. Mareuge. *Revue d'Hygiène*, April, 1896, p. 369.

I have now meandered along to the close of this somewhat desultory discourse. I wish to mention my obligations to two books: "The Lower Fungi in their Relations to Infectious Disease and Public Health," by C. v. Nägeli,[1] and Professor Tyndall's "Floating Matter in the Air." The former is an old book. It was published in 1877. It seems to be little known. So far as the American Index-Catalogue shows, it has never been translated. As to the details of bacteriology, it is now probably older than its years; but as to its physics, it deals with immutable laws, the application of which to microbes is merely extended by the progress of bacteriology. I frequently see v. Nägeli's name quoted as an authority in this department of knowledge, but this book is never referred to by writers on practical sanitation. Yet it abounds in the most practical applications of natural philosophy to the modern doctrine of infection, the knowledge of which would correct much that is erroneous in our writing[2] and our practice. Tyndall's book is well known. The study of it will give the student of public health clearer and more scientific ideas of the first principles of the process of infection than any special handbook or treatise on public health known to me. It seems to me that we specialists sometimes grope about the problems which beset us as if we worked in a sphere cut off from the general operations of nature. This not only gives us much needless labour, but it tends to make us deport ourselves as the high priests of a sect in place of acolytes in the ministry of one great temple.

---

[1] "Die niederen Pilze in ihren Beziehungen zu den Infectionskrankheiten und der Gesundheitspflege, von C. v. Nägeli, Professor in München, 1877."

[2] Even in the last edition of Parkes' *Theory and Practice of Hygiene*, where they have survived the editorial scrutiny of Notter and Firth, as they did of Du Chaumont, we find such statements as these:

"Solid substances lifted into the air by winds, or by the ascensional force of evaporation, fall by their own weight" (p. 130).

"It would appear that the ascensional force of evaporation will lift even animals of some magnitude from the surface of marsh water" (p. 131).

"Besides the organic matter, various vegetable matters and animals, floating in the air, are arrested when the air of marshes is drawn through water or sulphuric acid, and debris, plants, *infusoria*, insects, and even it is said, small *crustacea*, are found; the ascensional force given by the evaporation of water seems, indeed, to be sufficient to lift comparatively large insects into the air" (p. 137).

There is such a thing as the evaporation of molecules of water, but not of particles, still less of "comparatively large insects"! There is nothing in the air of marshes which does not get there after evaporation has let it free on the stems of reeds, the leaves of plants, &c., &c., to be blown away as dust.

CHAPTER XII.

DEAD MEAT INSPECTION.

THE DETECTIVE SYSTEM *V.* THE CLEARING-HOUSE SYSTEM.[1]

THE question of the day is tuberculosis. It is uppermost in the minds of local authorities and their officials, of the farmer and his landlord, of the cattle dealer, the meat salesman and the butcher, of the medical man and the veterinary man. It is before Royal Commissions. It claims the attention of Parliament in clauses of public and private bills and in questions to the heads of Government departments. It is the subject of conference and discussion, deputation and petition. The press is full of it, especially those periodicals which represent the material interests directly or indirectly affected. Indeed, when I say that the question of the day is tuberculosis, I have not so much in my mind the quiet, ceaseless, ever-widening flow of observation and research regarding tuberculosis which began with Villemin in 1864, and has grown beyond estimation in volume and in practical value since Koch's discovery of the bacillus in 1882. In that aspect the question of the day in the bacteriological laboratory and in the pages of periodicals and the proceedings of societies which preserve microscopic and biological results is doubtless this minute but mischievous bacillus. What I wish to point out is the influence of the modern doctrine of tuberculosis upon agriculture and commerce, in the market place and in the butcher's shop, upon the landlord's rent roll and the food of the people. It is always the case. The patient toil of the laboratory is pursued in secret, and the precious items of its results are summed up and carried forward day after day to new pages without noise or excitement. It is the application of these results to the affairs of men which produce conferences and discussions and deputations, which furnish war cries to political parties, and complicate still more the tangled forecasts of expediency in the deliberations of statesmen.

---

[1] Address as President of the Sanitary Association of Scotland, at the Annual Congress held at Dumfries, September, 1896.

There can be no doubt that the current agitation among those who breed and feed and sell animals destined for human food, who slaughter them and distribute them to the consumer, as to the where and the when and the how of meat inspection, is one of the manifestations of the interference of the modern doctrine of tuberculosis with the material interests of classes of men. I have not a word to say in deprecation of the agitation of the question of meat inspection with all its numerous side issues, but every party in the discussion speaks from his own point of view. He is more or less a special pleader. This is no disparagement to any body. It is human nature. The farmer wishes to pay his rent, the landlord wishes to get it; the meat salesman desires as big a commission on as large a turn-over as he can obtain; the butcher sees certain meat confiscated which he could sell. These are the common motives which actuate the most righteous and law-abiding of men; but inside every class there are with certainty to be found the few who are not righteous and not law-abiding. The rogues in all trades and callings may not unfairly be described as the parasites of the honest. Their mode of life is to rouse the suspicions and trade upon the good reputation of the majority. You never hear of them or see them at conferences or on deputations. They get the honest men to shout. They convince them that the proposed law or the suggested interference will kill the legitimate trade, whereas the fact is it will only render some nefarious practice of their own impossible. In this matter of meat inspection sanitary authorities speak from the point of view of the consumer. They have no private interest whatever to serve. I represent a sanitary authority which has the misfortune to have adopted a policy and advocated views both as to meat and milk inspection which are very distasteful to each and all of the private interests concerned. From my reading of the evidence given before Royal Commissions of leaders in agricultural journals and veterinary magazines, of reports of speeches made at conferences on clearing-houses, and deputations to Secretaries of State, I have come to think that Glasgow occupies, in the suspicions of some gentlemen, in a small way, much the same position as Lord Salisbury does in the dreams of the statesmen of Europe. They discover Glasgow everywhere mining and countermining, adding a deeper tinge of black to the cloud of agricultural depression, ruining the trade of the meat salesman, thwarting the speculations of the butcher, invading the professional perquisites of the veterinary surgeon. Gentlemen, I am not concerned to rebut those charges on behalf of Glasgow. Those who make them represent their own interest. The sanitary authority of Glasgow represents the interests of the consumer. Since 1882 it has in those interests shaped out definite policy with reference to meat inspection. It has successfully defended and enforced it in the law courts at enormous cost. It has accumulated information in support of it by deputations sent over the principal markets of Great Britain and the continent. It has incorporated it in local Acts. Glasgow is satisfied with this policy, and intends to stick to it. I have not come here to enter into controversy with anyone. It is very necessary that amid those more or less selfish disputants the consumer should keep his eyes open, and that those eyes should be intelligent, well-informed eyes. It occurred to me that I could not have a better opportunity of educating the consumer as to the necessities of the conditions under which meat inspection falls to be carried out than under the auspices of the Sanitary Association of Scotland, and on the occasion afforded me by your kindness in elevating me to the position of your President. I am sure there will be absolute unanimity among us in accepting this proposition, that in the interests of the consumer all butcher meat, at some period between the time when the meat derived from it is distributed to the user, ought to be inspected and passed by a competent public inspector. There is no need to support this proposition by argument. It is fair and reasonable and, in fact, as we shall see, necessary, because the whole philosophy of meat inspection is this, that the further removed from the entirety of the animal to which it originally belonged, the more difficult it is to determine the wholesomeness of the part. In the case of the morsels which are retailed to the consumer this difficulty amounts to an impossibility. The supreme question therefore is, when can an inspection of butcher meat in the interests of the consumer most effectively be made? To which my reply is that the only time when effective inspection can be made is at the place and at the time of slaughter. My next proposition is but a corollary to this, and for the convenience of discussion I state it now. It is this. If an animal is not inspected in the interests of the consumer at the time of slaughter, but comes for the first time under inspection as dead meat in whole carcase or in parts, the whole risk is taken by the consumer, *i.e.* all the chances are in favour of the person who submits the carcase. These propositions stand or fall together. We are here at the very heart of the controversy regarding meat inspection. The physiologist and pathologist never lose sight of the fact that the portion of meat was part of a living animal, that if the animal was diseased either constitutionally to begin with, or constitutionally as a sequence of some condition which was primarily local, then every part of the animal was diseased. The physiologist and pathologist say: " Show us the animal when it is alive and its whole organs and parts when it has been slaughtered, and we will pronounce judgment on the wholesomeness of the whole animal." The butcher says: " Allow me to kill the animal and ' dress ' the carcase, and then I shall draw aside the curtain and admit you to the contemplation of a work of art." The fact is so thoroughly artificial is the butcher's conception of the structure and constitution of a carcase that he will confidently submit it in detachments—tongues and sirloins, rumps and quarters, for the matter of that, chops and steaks, just as a man might submit fossils to the geologist or pebbles to the mineralogist, taking to himself credit all the while for frankness to the Inspector, and fair play to the consumer. To the butchers, tongues and sirloins, rumps and quarters, chops and steaks are things which are knocking about the world as God made them. The meat inspector must pick them up where he can, or contemplate them with wonder and surmise when put into his hands. Their face is their fortune. They are self-contained. They have no historian. Professor Owen built up the skeleton of a fossil animal by a 'cute reasoning from his observation of a single bone, and from a tooth he worked out a fair idea of its habits and manner of life. Well, it has pleased providence, in order to keep men out of mischief, to fill the world with interesting puzzles and problems. It is quite unnecessary for the butcher to add to their number. I am sure Professor Owen would have much preferred to see his animal in life and to have dissected it at leisure, and he would have been the last to deny that if he had, he would have been able to make many corrections in the animal which he built up by reasoning from a bone or a tooth. In like manner the meat inspector may be able from a " dressed " carcase, or even from a fragment of it, to reason out and build up a conception of the living animal; but it would be much easier for him to begin at the other end, and, without disparagement to his abilities, whether he be an experienced butcher or a veterinary expert, it would be much safer in the interests of the consumer.

Here I beg you to observe that I have not expressly, or by insinuation, deprecated this process of dressing as in its intent necessarily dishonest or in its nature improper. On the contrary, I explicitly admit that, to a certain extent, it is a legitimate trade process which is necessary for convenience and for that propriety in the preparation and presentment of food of all kinds which is not merely of commercial but of physiological importance. But in what exactly does this process consist? It consists, speaking generally, in the skinning of the animal, the removal of the head and feet, the sweeping out from the cavities of the chest and abdomen of all the organs and viscera (except the kidneys) with their attached glands, and the diaphragm or partition which separates those cavities. A very rudimentary acquaintance with pathology enables one to understand that in doing this the butcher removes from the body the parts most likely to contain evidences of disease. It is sometimes of importance not merely to determine whether in general the animal has been diseased, but what precisely the disease has been. Without the viscera this may be absolutely impossible. I should like to see what the professor of pathology in any of our universities would make of a human body deprived of its head and all its viscera, and placed before him without a clinical history of the case, in order to discover of what disease the person had died. Every carcase dressed in the ordinary way and then submitted to inspection is exactly in the same position, only the problem is more puzzling in the animal, because veterinary surgeons do not allow their patients to die. They may be killed before the disease of which the viscera might show unmistakable signs has produced marked changes in flesh, and if the disease should happen to be one which in itself involves danger to the consumer, then any judgment which turns on the condition of the flesh alone must be to the prejudice of the consumer. It is an article in the creed of every butcher that a carcase thus dressed, and every several part of a carcase, ought to be taken and judged on its merits; that it contains within its dimensions all the information which can reasonably be asked. In fact, an operative butcher will not hesitate to show his proficiency by sundry parings and trimmings and deft uses of his knife in the scooping out of tell-tale glands or the closer cutting of "the skirt" or attachment of the diaphragm or the stripping of the pleura from the ribs or bits of the peritoneum from the walls of the abdomen.

These deviations from normal trade practices readily catch the eye of an experienced inspector and rouse his suspicion. But when he comes to attempt to make his suspicion into a case for submission to a Court, he must produce positive proof of a precise allegation. The absence of bits of the dressed carcase is only good as evidence of a guilty knowledge of the nature and effect of a diseased condition after the existence of that condition has been otherwise proved. Any such marks on a carcase undoubtedly depreciate its value in the wholesale market. Every retailer knows what they mean, though they may make no difference in the retail prices. I note the facts at the present time because they emphasise the effect of the whole process of dressing, which is to deprive the inspector of evidence as to the condition of the animal at the time of slaughter, and to make of every carcase of "dead meat" a possible case of trial of a suspicion by circumstantial evidence in place of direct proof. It is well known that all over the country there are butchers of the class referred to in Walley's "Practical Guide to Meat Inspection," where we find two pages headed—"The Carrion Butcher and his Traffic." He might be even more appropriately styled the "salvage butcher," for in all the misfortunes in the shape of accident or disease which befall live stock, he turns up with his offer to take the carcase and do the best he can for the owner, or pay a few shillings for it and do the best he can for himself. The more reckless of these gentlemen try to reach low-class shops in towns clandestinely. There, just as stolen plate is cast into the melting pot by the resetter, the smuggled carcase is speedily boned and minced. But if they know of a market where their wares can be submitted to inspection without risk of a fine or imprisonment in case of detection, they willingly face the arbitrament. They know the chances are all in their favour. If the carcase is seized they lose nothing but the carriage. If it passes the profit is considerable. I quote the words of a distinguished writer on veterinary subjects. Dr. George Fleming—"The inspection of flesh after the carcase has been cut up is not very satisfactory; hence the necessity for examining it while the carcase is intact or in process of dressing, and also examining the animal before it is killed. The organs in the chest and abdomen should be seen; for when these are removed and the body quartered in the usual way, it is often most difficult to distinguish the flesh of a diseased from that of a healthy animal in some cases; though generally there are physical differences, sometimes very slight it is true. The difficulty is, of course, greatly increased by the butchers who resort to every artifice to conceal diseased meat, and sell it as sound.[1]

It comes to this, then, that the inspection of dead meat as compared with the inspection of animals and their carcases at the place and time of slaughter is analogous, as regards ease, efficiency, and certainty, to the process of bringing home a crime to a suspected criminal by circumstantial evidence as compared with the positive evidence of eye-witnesses. Nothing brings this so forcibly before one's mind as reading a book on meat inspection. One cannot but be struck with the fact that all those minute and interesting details as to the colour of flesh, the odour of medicines administered during life adhering to the flesh after death, the taste, the consistency, and other physical properties of flesh are merely indirect methods of arriving, by circumstantial evidence, at knowledge which is actually in the possession of somebody. All the diseased conditions of living animals are gone over; much information as to their pathology is imparted; and we are told that the meat is marketable or unmarketable, wholesome or unwholesome. But in the case of dead-meat we are thrown back upon circumstantial evidence for proof of the disease. Often we are informed that, if the inspector happens positively to know that the disease was so-and-so, then he must condemn the carcase; but if he does not then he must be guided by the condition of the meat. In the case of Anthrax, the most dreadful disease which is common to man and animals, Walley says: "No matter what condition the carcase of an animal may present, or however firm and good it may appear, it should be unhesitatingly condemned and destroyed, if indubitable evidence of the existence of Anthrax is forthcoming" (3rd ed., p. 108). But we again turn to the works of the well-known veterinary surgeon, Dr. Fleming, and we read, "From what we have said as to the necroscopical appearances in this disease, there is no difficulty in arriving at a decision *if the animal is not dressed*, and still retains its internal organs. The characteristic alterations will then be readily recognised. But when the carcase has been dressed and prepared for sale, it is difficult though not impossible perhaps, to arrive at a satisfactory conclusion" (Vol. II., p. 109). We also find in the French Meat Inspectors' Manual, which emanates from the veterinary staff of the Central Markets of Paris, the statement that "Anthrax is frequently detected among the carcases forwarded from without to the Parisian Meat Market. It is always difficult to recognise this disease in carcases deprived of their viscera, and originating in animals killed on the first appearance of symptoms" (p. 208 [1]).

---

[1] *A Manual of Veterinary Science and Police*, Vol. ii., p. 569.

There is no occasion on which the meat inspector is put to a greater disadvantage by the process of dressing than in the examination of the carcases of animals affected with the much-talked-of tuberculosis. I am not now concerned in the least with the burning question of total or partial condemnation, or, if partial seizure, by what criteria we are to be guided. What I assert and wish the consumer to understand is that, whatever method of dealing with tuberculous meat is adopted, it must be based upon a knowledge of the whole facts. If total condemnation is required, then the carcase of every tuberculous animal must be seized. Before it can be seized, it must be recognised, and we know that the viscera often contain the sole evidences and always the principal evidences. If, on the other hand, partial condemnation is thought to be sufficient, then the criteria laid down always turn upon the condition of the viscera. This, in fact, is the essence of the distinction between generalised and localised tuberculosis. Take, for instance, the famous French decree of July, 1888. No animal suspected to be tuberculous is to be removed except for slaughter under inspection, and article 11 reads thus—

---

[1] *Manuel de l'Inspecteur des Viandes*, par L. Villain et V. Bascou, Meds. Vets., Chef et Controleur du Service d'Inspection de la Boucherie de Paris, &c., 2ieme ed. Paris. 1890.

"The flesh of tuberculous animals is excluded from use as food.

"1. If the lesions are generalised, *i.e.* not exclusively limited to the visceral organs and their lymphatic glands.

"2. If the lesions, although localised, have involved the greater part of a viscus or are manifest in an eruption on the walls of the chest or abdominal cavity."

How, possibly, could such criteria be applied to a dressed carcase, or to a fragment of a carcase? Let us hear what the Parisian veterinary staff have to say. "It is a matter of observation that, when tubercle has involved the lymphatic glands then the animal is generally emaciated and the flesh watery, so that it is unnecessary to raise the question of tubercle to justify seizure. But this is not always so. Cases of generalisation in animals of first quality are far from rare. . . . When one, for the first time, sees the enormous amount of tubercle found in the viscera, and on the serous membranes of both cavities, and when, on the other hand, we also note in the same animal, bulky muscles, the flesh of a fine red colour well mixed with fat, the masses of suet about the kidneys, and the thick folds of mesenteric fat one is truly astounded." Yet, they add, such a carcase they totally condemn. I do not now express either approval or disapproval of their decision; but I say it was based upon a knowledge of the whole facts, which not even those experienced French veterinary surgeons could have obtained by the minutest scrutiny of a dressed carcase, still less of isolated fragments. In the "Report of the Royal Commission appointed to inquire into the effect of food derived from tuberculous animals on human health," the Commissioners, in the same paragraph (49) in which they report that Dr. Martin "sees no objection to the sale of meat substance from carcases which have shown only localised tuberculosis under sundry stringent and exacting conditions, give prominence to the statement that he advocates" as a principle that the operations of slaughter and dressing should be done under skilled supervision." In a subsequent paragraph (51) they give their own opinion in these words—"It is hardly necessary to point out that little evidence about the more serious degrees of tuberculosis would be discoverable in carcases from which the organs had been removed; and that this is habitually the case in 'so-called dead-meat,' whether English or foreign." The Commissioners found that, though their scientific and practical witnesses differed as to the treatment a tuberculous carcase ought to receive when detected, they were agreed in this opinion. The President of the Glasgow United Fleshers' Society, in answering this question with reference to foreign dead meat. "in such a case you say that the opportunity is lost of seeing whether the animals from which the carcases came were tuberculous or otherwise?" (1777), Replied—"I think it would be very difficult in any case to tell from dressed carcases what the original condition of the animals was, or whether they were infected with tuberculosis or not." This was only a corollary to a previous answer. The question was—"Then, does it come to this, that the evidence of the existence of tuberculosis is only to be ascertained at the place of slaughter?" 1721.) The reply was—"I think it can be ascertained there with greater certainty than afterwards." In this respect, then, there is but one voice from veterinary experts, medical experts, Royal Commissioners, and the intelligent and fair-minded butcher. Whatever be the principle adopted in adjudicating upon the destination of the flesh of a tuberculous animal, it must rest upon a full knowledge of the facts, and this cannot be obtained from a dressed carcase, still less from isolated parts of carcases, and can only be obtained with certainty in the slaughter-house.

Gentlemen, you will remember that I have been speaking throughout in the interests of the consumer. The breeder, the feeder, the salesman, the butcher have each, no doubt, more or less important interests in the quality of the roast, but surely the man who is about to eat it has the most serious interest of all. It is only at the time and place of slaughter that the secrets which so gravely touch the interests of the consumer are fully revealed. Those interests, therefore, can be best protected by measures which secure in the first place, the abolition of private and the substitution of public slaughter houses, and, in the second place, the establishment in connection therewith of an efficient system of inspection. From the consumers' point of view, the broadest description we can get of a perfect system of protection is one which results in the largest proportion of the total meat supply, whether it is native or foreign in origin, being efficiently inspected at the time and place of slaughter.

From the point of view which is *not* that of the consumer the most perfect system for convenience in the prosecution of an opposed interest is one which results in the largest proportion of the total meat supply being either not inspected at all, or inspected as dead meat at what has been named a "clearing-house." Bearing these propositions in mind, let us as consumers consider the character and effect of the proceedings at a recent conference of Local Authorities[1] on the inspection of dead meat held in Edinburgh, at which Glasgow, by the way, was not represented. It being admitted that the general law is defective, and that something requires to be done to enable Local Authorities to protect themselves more efficiently—two courses were, from our point of view, open to this Conference. It might either have seized the opportunity of a new Public Health Act to have impressed upon the Local Government Board the necessity of public slaughter houses being substituted for private in all boroughs, and enabling District Councils, where expedient, to provide abattoirs, in both cases with efficient inspection, or if, for whatever reason, not prepared to interfere with the present system of private slaughtering, it might have been expected to adapt its recommendations to that system so as to secure the greatest amount of protection for the consumer possible under the circumstances. This Conference took neither of these courses. It took a third course which was not the tempting and proverbial compromise, but absolutely in favour of every interest which is *not* that of the consumer. I do not believe that the representatives of local authorities were knowingly promoting those interests, but they certainly were misled by those who were, and were guided to a resolution most mischievous to the consumer. The theory of a clearing-house is simple, specious, and attractive, yet in the light of the facts which I have endeavoured to make clear to you in this address, I commend this extract from the chairman's opening speech to your consideration. He is reported in the *Scotsman* to have said, "As a rule, feeders sold the carcases of animals to a class of men who took the risk of selling them in town, and thereby rendered themselves liable to prosecution. What was wanted was simply this, that a legitimate way could be obtained whereby these feeders could dispose of these carcases, get them inspected, and, if unfit for food, taken and destroyed. They in the counties had not the least desire to try and enforce the sale of unsound meat. On the contrary, it was their desire that their food should be wholesome and good, and it was with that object that they sought assistance in having a clearing-house, so that a legitimate mode of inspecting carcases and sound meat should be opened up." Now, although the word tuberculosis was never mentioned in the course of this meeting, so far as reported, there is no doubt whatever it was uppermost in the minds of those who promoted it. Observe the pitiful

---

[1] Under the Contagious Diseases (Animals) Acts, not the Public Health (Scotland) Act.

case which it is sought to befriend—that of "a class of men who took the risk of selling carcases in town." They took the risk, and, it seems, occasionally found themselves prosecuted. There is no risk in offering a healthy, wholesome carcase for sale either in town or country. It is to be supposed that this "class of men" knew their business, and would therefore see when they bought the carcase from the feeders that a risk would attend the sale of it, and no doubt an allowance was made for this risk in the price at which they bought. Why should they not bear their risk to the end? There *is* a case which has always had my sympathy—that of the man who buys a good-looking animal at a fair price in the public market, who drives it to a public slaughter-house, and in ten minutes finds his purchase worth no more than its value for boiling down. That is a case of pure misfortune. But I have no sympathy whatever for the pets of the Edinburgh conference. You are not to imagine them submitting their carcases to the "qualified veterinary inspector" who is to preside over the clearing-house, with authenticated information as to the original owner and the slaughterer, with certified notes of the condition of the viscera, and, generally speaking, with an ingenuous and obliging endeavour to supply the gaps which exist in the knowledge of the inspector because he was not present when the animal was slaughtered. You are not even to think of whole carcases being submitted, but also of halves and quarters and smaller segments of carcases, the remainder of which it has been thought would increase the risk too much if also submitted. Observe, I do not say that all the dead meat from the counties represented at this conference would be of a doubtful quality, nor that all the persons who constitute the "class of men" referred to are capable of such practices; but I say that it is among this "class of men" that the carrion or salvage butcher would be found, that no inconsiderable proportion of the total meat submitted at this clearing-house would be the dubious rubbish in which he speculates, and in every case the unlucky consumer would have the whole risk, for you will observe that the main object of the suggestion is to abolish the risk of prosecution. The worst that could follow a seizure in a clearing-house would be the confiscation of the meat.

In the absence of a system of public slaughter-houses with efficient inspection over the country, such as prevails in most European countries, the best method of dealing with this dead meat trade is by detective inspection by a staff of experienced officers, who will watch railway stations, wharves, carriers' quarters, &c.; intercept lorries, suspicious looking butchers' carts, &c., on the street; visit the shops where low-class meat is sold; and who can be sent to the country to interview the owner, see the butcher who slaughtered the animal, the veterinary surgeon who attended it, and otherwise get up to the best advantage all the information necessary for a prosecution if the circumstances require it. This is the system of controlling the dead meat trade which has been pursued in Glasgow since, under our 1890 Police (Amendment) Act, we obtained enlarged powers of seizure and prosecution. A short history of our experiences may prove entertaining and instructive.

Glasgow was rudely wakened up in 1882 to the possibilities of dead meat inspection, by the discovery that over 60 cows from a suburban dairy had been slaughtered in various stages of Anthrax, and, with cognisance of the veterinary practitioner in attendance dressed and sent into the dead meat market. All passed inspection except one, and had been sold before the facts became known. It is unnecessary to trouble you with the stories of difficulties, partly administrative, such as impede new departures in all communities, which are not kept fully overcome; partly legal, which are now wholly removed. In 1889 we had our famous tuberculosis trial, which established a standard for both the Police and the Sanitary department. In 1890 came the Act already referred to. The first case under the detective system arose out of the seizure of half a tuberculous cow in a butcher's shop, and resulted in the exaction of ten pounds each from the butcher and the man in the suburbs from whom he bought it. The next case led to the discovery in the dung hill of another suburban butcher of the missing fourth quarter of a cow seized in Glasgow. He had obtained the animal from a farmer, and was therefore one of that "class of men who take the risk of selling in town." In this case the speculation landed him in a penalty of £20. These two prosecutions effectually stopped this trade in the suburbs. Since then, the investigations of the officers had led them far afield. They have been in twenty-five of the counties of Scotland, from Dornoch Firth in the North to the Solway in the South. On one occasion they crossed the Border into Cumberland. A chief inspector, Mr. Warnock, has given me notes of his adventures and discoveries in the course of these expeditions. They read like a chapter from Conan Doyle. The story of two portions of beef (they could not be called quarters, they were cut so irregularly) forwarded from a small town in Elginshire, and seized in a lorry in George Square, Glasgow, in 1892, may be taken as a sample.

"I was instructed to go north and discover, if possible, what had been done with the portions retained at home. I was aware from my examination of the parts seized that they had been cut, trimmed, and dressed from a tuberculous carcase. The consigner was a butcher. I found him in his shop, but he declined to answer questions. A telegram from Glasgow had preceded me. I looked over the meat hanging in the shop, and saw that none of my carcase was there. After a little conversation he let fall the name of another butcher to whom he had given the missing half. When he saw that I was going to interview this butcher, he said he gave part away for pigs' meat, and that he was feeding his own pigs with the portion retained. I went to his piggery, in which were two newly-weaned pigs, and in a sleeping compartment under some straw found a fore-quarter of beef. The butcher then admitted that he had hidden this portion in the piggery, and had given the other quarter to his friend to do the same. Neither of these quarters had been trimmed or stripped. They showed that the animal had suffered from generalised tuberculosis. From the forwarding clerk at the station I learned that special instructions had been given to send on the meat by Elgin down to the Highland line, not by the usual route, *via* Aberdeen, where there is a very active surveillance over dead meat in transit." The witnesses were brought down to Glasgow, the case was strenuously defended, but the Stipendary found the man guilty of sending the meat for human consumption, dressed with intent to conceal the facts, that it was diseased, and imposed a penalty of £20. An appeal was taken to the High Court, where it was dismissed.

I have no desire to revive the bitterness of a fight in which the Local Authority was victorious all along the line. But the facts of history, though they may be forgotten, remain on record, and if the lessons are likely to be missed, these facts must be revived. The facts, which are recorded regarding the application of the detective system of inspection to the dead meat trade of Glasgow, are that it was contested foot by foot not merely in the local Courts, but in the Higher Courts on appeal; that the actual defendants could not possibly sustain this expenditure, that the business advertisements of meat salesmen in Glasgow inserted in country newspapers, contained from time to time warnings and instructions "to butchers, cattle-dealers, and farmers," as to risk attendant on Glasgow consignments, and how to obviate them; and that these were backed up by legal arguments in Court, and by the evidence of meat salesmen called in defence. There was some preliminary skirmishing over the fact that in 1882 the Authorities had seriously considered the idea of a clearing-house, and had even gone so far as to insert a clause in a draft Bill to enable them to carry it out; but the logic of events between that date and 1890 convinced them of their mistake, and converted them to the detective system. Thus also they discovered the remarkable but not unnatural difference between the retail butchers and the wholesale meat salesmen as to this clearing-house. The former opposed it. In fact, the statements of a deputation of the Glasgow United Fleshers' Society confirmed the judgments of the Local Authority against the system. The next line of defence was indicated by the warning—"Please note that all carcases forwarded to Gasgow, which are unfit for human food, must be labelled for *boiling-down purposes*, and a letter of instructions must be sent to that effect. If this is not complied with, senders will be liable to a penalty of £20." Surely the most remarkable guise under which to conduct a trade in butchers' meat which it ever entered the mind of man to contrive. This method was exposed in its naked absurdity by a case in which roasting pieces, evidently cut from an unsound carcase, were labelled "*for boiling-down purposes*." The case was defended as usual, and the defence produced evidence from the usual quarters; but the Stipendiary said that he was satisfied, upon careful consideration of the whole evidence that the labelling of the meat was a mere device for the purpose of trying to prevent it being seized. He had no doubt that the meat was intended and might have been used for the purpose of sale for human consumption. He imposed a penalty of £10. The case was as usual appealed, and the appeal was as usual dismissed.

The next line of defence was labelling the consignment "for inspection." The first case concerned the carcase of a cow which, after local inquiry, was found to have died of puerperal fever. The deliverance of the late Stipendiary Gemmell, whose lucid and discerning line familiar with every point in such cases, was of the greatest service to the public, clearly shows the lines followed by the prosecution in combating this defence. Something more was required, he said, than a label marked "for inspection." The accused should have intimated to the consignee the whole circumstances connected with the death of the cow and that the carcase was sent on specially to see whether there was really any ground for allowing it to be sold for human food. Externally the meat might have passed; but if the accused had sent word to the inspector that the animal had died of puerperal fever, it would never have passed inspection. This device seemed to take the fancy of consigners, as it was extensively adopted, but in no case did it avert success in prosecution.

The last ditch in the contest with the dead meat trade was inspection and certification by a veterinary surgeon prior to despatch. In the course of local investigations, we occasionally found that the consigner, usually a farmer, had been advised by the veterinary practitioner in attendance, in which case the ends of justice seemed to be satisfied by a surrender of the carcase. It is startling, however, to observe what veterinary practitioners will do. There, for instance, was the case of two rumps of beef, sent from Forfarshire, the remainder of the carcase and viscera being buried in the farmer's garden. The inspector had them exhumed, and found the lungs and abdominal organs stuffed with tubercle, and the serous membranes covered with tuberculous vegetations. The case was reported to the Fiscal, and the veterinary surgeon was summoned as one of the witnesses; but after repeated postponement on account of the defendant's illness, a pledge was accepted and forfeited. So we lost the pleasure of hearing this gentleman's views explained from the witness box. There, also, was the case of an emaciated and jaundiced bullock, which the veterinary excused himself for passing by the circumstance that he examined it by candle light. It is but occasionally that a veterinary certificate is attached to the carcase, and if the carcase bears on the face, and in the history of it, a certificate to the opposite effect, we pay no respect to the written document. Indeed, in the last case of this sort, after the usual local inquiry, we summoned the certifying veterinary surgeon as a valuable witness for the prosecution. The owner was one of that "class of men who take the risk of selling in town." He bought the carcase of a cow which had its throat cut when on the verge of death from "stomach-staggers," and was not disembowelled for four hours thereafter. He paid 50s. for it, with a young beast with a broken leg thrown in to the bargain. His veterinary certificate did not save him from "the risk of selling in town," as he was fined £5 and lost his cow.

Manifestly the veterinary practitioner is placed in a most unenviable position by these requests for a professional opinion in matters where the public interest and the private interest of his client may be opposed. I speak as a member of a profession which, in matters of public health *v.* private interest, frequently occupies the same position as the veterinary surgeon. I am very anxious to avoid giving offence, and none can be taken if I apply the same standard in these respects to the veterinary surgeon and the medical man. It is acknowledged both by the Sanitary Authorities and by the common sense of my profession that it is more than the average man can be expected to do to condemn the property of his patients and to do many public acts which must be done, but which are unpleasant to individuals. I see that the veterinary profession abroad does not affect to be above the common frailties of mankind. At the third Session of the Congress for the Study of Tuberculosis, which meets periodically in Paris, and is attended by the most notable members of the profession from all parts of Europe, one of the subjects discussed was, "the advantages of a general system of meat inspection," in the course of which Dr. Stubbs, chief Veterinary Inspector of the Belgian Board of Agriculture, described the Belgian system, which provides a veterinary inspector in each province, and either a veterinary or non-veterinary inspector in each Commune; all withdrawn from private interests which might interfere with their official independence. Some animadversions were made on the selection of non-veterinary inspectors. In his reply Dr. Stubbs pointed out that in some communes it was the only way of avoiding the appointment of a man in practice. "The veterinary practitioner," he said, "has frequently to report on the flesh of an animal he has treated. You see, then, what may happen. As a matter of fact, however honest he is, he is tempted not to be too hard; or, if he is, what happens? His client will say, 'I shall call in Mr. So-and-so, who is not so strict.' It is therefore necessary that the expert should be independent of the owner of the meat he inspects." Professor Nocard, of the famous Alfort Veterinary School, spoke in the same sense; and on his motion a sentence was added to a resolution before the Congress in favour of a general system of meat inspection, in villages and towns alike to this effect, "The inspecting staff ought to be organised more or less on the model of the Belgian system." It is of interest, as confirmatory of the position for which I have been contending, to that that, like all continental meat inspection, the Belgian system rests upon inspection at the time and place of slaughter, and is so worked that the flesh of animals so inspected shall be premiated in the market, being marked as such. Article 5 of the Belgian regulations of the trade in meat refers to the home trade:—

"After the slaughter, and before the carcase is cut up, the skin or hide still adhering thereto, the inspector shall inspect the carcase and the internal organs. While awaiting the arrival of the inspector, the abdominal viscera shall be extracted *en masse* and preserved, so as to maintain their natural proportions. The organs of the chest shall be left adherent to the carcase, and in the case of solipedes, the trachea and larynx shall also be left intact."

The conditions under which dead meat is permitted to be imported sustain, as far as possible, the same principle. Still such meat is specially marked. Article 13 refers to this branch of the trade:—

"Fresh meat imported from abroad will not be admitted except in the form of whole carcases, half-carcases, or fore-quarters, and on conditions that the lungs are adherent thereto."

You can have no difficulty, in remembrance of the experiences of the detective inspectors, in reading the significance of the exclusion of hind-quarters, unless attached to their corresponding fore-quarters, which must retain the lungs. This is much better than hunting for the lungs and missing quarters in piggeries or in farmers' dunghills and gardens.

Just one word as to the effect of the detective system on the meat supply of Glasgow. Nothing shows this better than the decrease in the number of seizures. Whereas at the outset these were numerous, and the inspectors were constantly on the rail following up their seizures to the consigners in the country, now a seizure is a rare event. Weeks may pass without a find among the hundreds of consignments overhauled. All over the country Glasgow used to be looked upon as a promising market for the salvage of the farmers' casualties and the speculations of the "carrion butcher." Now it is everywhere known as a place to be avoided. Even the character of the rare cases investigated is different. They are generally consignments made by farmers in remote parts of the country, without any attempt at concealment by special dressing, following the traditions of their calling more in thoughtlessness and ignorance than with criminal intent. The ends of justice are met by the surrender of the carcase and a warning not to do it again. The combined result is that meat cases, instead of being called in Court every other day, are now the rarest of events.

Now, gentlemen, let me in conclusion, even at the risk of "damnable iteration," once more clearly set forth my main thesis—that, no matter how you organise your system of meat inspection, no matter by what principles you are guided in the disposal of the abnormal meat when you have detected and detained it, whether you think the flesh of an animal, suffering from this disease or from that, is wholesome or unwholesome, whether you stamp or do not stamp, whether you adopt the German *Freibank* or the British dipping-tank and digestor, whether you compensate or confiscate, whether you go in for the "clearing-house" and plenary absolution for the "class of men to take the risk of selling in towns," or the detective system and criminal prosecution; as regards the interests of the consumer, the inspection of dead meat is only what is vulgarly called making the best of a bad job. In proof that it is so, I have called evidence from every quarter, scientific and practical.

In the course of this address I have unavoidably touched upon many matters of controversy which are quite worthy of separate treatment, but I beg of you, whether you are officials or representatives of local authorities, not to allow your minds to be shunted off from the main thesis to any of these side issues : and I deprecate on the part of my critics any attempt to obscure the discussion of the main question by raising these side issues. As to the practical application of this thesis, whether by general legislation or local administration, that must be left to time to settle after the slow fashion of this old country. Meanwhile, however, and now, it dictates to us on behalf of the consumer, an attitude towards the home dead meat trade, as we know it in our towns, at least of suspicion if not of active hostility, and above all things not of credulous confidence.

INDEX.

Air, 143, 157, 368.
Air, purity tested by smell, 169.
Air space of a room, 514.
Air space and mortality, 522.
Adelphi Hair Factory, outbreak of Anthrax, 412.
Alcohol, deteriorating effect of, 311.
Alcohol, in typhus fever, 444.
Alcohol as a food, 445.
Alcohol as a stimulant, 446.
Anthrax, 412.
Arnott, Dr. Neil, Report to Poor Law Commissioners, 9, 41.

Baths and Washhouses, 42.
Blackie, Lord Provost, 26.
Bridgegate, 10, 12, 179, 209, 215, 260, 273.
Bright, Right Hon. John—Rectorial address, 189.
Brown, Dr., state of New Vennel, Havannah, etc., 11.
Building Regulations, 14, 102-113, 183.

Chadwick, Mr., 10, 290.
Chalmers, Rev. Dr. Thos., 31.
Chickenpox, 366.
Child father of the man, physically, 311.
Children of the city, 301.
Children, death-rate among, 309.
Cholera, 3, 14, 18, 22, 259, 356.
Cities, growth of, at the expense of the country, 303-308.
Cities, attempts at limitation of, 301.
Cornet, Dr., protection from consumption, 551.
Cowan, Dr., 7, 79.

Dairy farm, sanitary requirements of, 405.
Dead meat inspection, 592.
Deaths, uncertified, 485 (note), 502, 524.
Density of population in relation to health, 138, 171-172, 287, 494.
Density of population in relation to air, 143.
Density of population, increase of, 281-284.
Diarrhœal diseases, 356.
"Dirty neighbour?" "What am I to do with my," 257.
Diphtheria, 352.
Disinfection, 571.
Disinfection and washing-house, 21, 22, 56, 59.
Drain testing, 55.

Editorial notes, 1-3, 27, 54, 65, 95, 147-153, 324, 444, 481.
Engel, 295.
Enteric fever, 335.
Enteric fever and milk epidemics, 22, 55, 325, 336.
Erysipelas, 364.
Extension Acts, 3, 17.

Farr, Dr., 138, 170, 254, 287.
"Fever," 4, 5, 15, 16.
Fever hospitals—
    Parliamentary Road, 21, 22, 43.
    Belvidere, 22, 24, 58, 339.
    Ruchill, 24, 59.
Fever hospitals, History of, 66-99, 73, 76, 83, 325.
Fever hospital statistics, 71.
Flatted tenements, 135.
Fog in Glasgow, 371.

Gairdner, Dr. W. T., 19, 20, 21, 25, 27, 28, 32, 82, 83, 358.
Gairdner, Dr. W. T., on alcohol in fevers, 446.
"Ginx's Baby," 314.

Glasgow, "a semi-asphyxiated city," 142.
Glasgow, former state of, 284.
  " population of, 481.
  " population in the districts, 485-490.
Glasgow Herald, feus on Milton Estate, 14.
Graham, Dr. Robert, condition amidst which fever spreads, 5, 24, 25.

Hannah, Dr., description of High Street, 12.
"Hawkie," 243.
"Health Committee, formation of, 22, 24.
Height of ceiling of room, 516.
Hospital construction, 50.
Hospital reports, 43.
House, the, 153.
  " construction, 39.
  " in relation to public health, the, 170.
  " in relation to mortality, the, 177, 210.
Houses "made down," 222.
  " ticketed, 27, 160, 185, 206, 271, 277, 514.
  " uninhabitable, 224, 228.
  " " inhabitants of, 234.
  " owners of, 239.

Ideal commonwealth, 293.
Improvement Acts, 22, 24, 26, 57.
Improvement Trust, 57.
  Results of operations, 96, 113, 122, 126.
  Size of house occupied by persons displaced before and after operations, 98, 115, 124, 127.
  Rental before and after operations, 98, 118, 124, 128.
  Number of inmates before and after operations, 99, 118.
  Distance from centre of city before and after operations, 100, 120, 130.
  Social status of inhabitants, 123.
  Provision of dwellings for people displaced, 132.
Infection, physical laws which govern the distribution of, 582.
Infectious diseases, municipal policy as to, 69-70, 71.
  Arrangement with School Board, 55, 88, 343.
  Endemicity of, 254-257.
  History of, in Glasgow—
    Typhus, 327.
    Smallpox, 329.
    Enteric fever, 335.
    Relapsing fever, 339.
    Scarlet fever, 344.
    Measles, 346.
    Whooping-cough, 349.
    Diphtheria and croup, 352.
    Diarrhœal diseases, 356.
  of children, 340.
Influenza, 366.
Insurance in friendly societies, 503, 526.

Kennedy, Dr., condition of Bridgegate, 10.
Koch, Dr., 529.

Life in one room, 189.
Limitation of cities, attempt at, 301.
Lodging-houses, 14, 15, 243.
Lungs, diseases of, 370.

Measles, 94.
Medical Officer of Health, 19, 20, 23.
Milk and the dairy farm, 405.
Milk and infectious diseases, 22, 55, 325, 336, 346.
Miller, Captain, condition of High Street and Wynd, 8.
Mortality Bills, 4, 8.

Nageli, Dr., 591.
Nursing, 44-50.

Ogle, Dr., 181.
Overcrowding, 5-13, 28-31, 33-38, 103-113.

Paul, Henry, lanes and closes, 8.
Perry, Dr., 10, 25, 79.
Phthisis, 366.
Play, necessity of, 316.
Police and Health Acts, 3, 15, 17, 19, 20, 22, 58, 59.
Political meetings, absence of interest in public health at, 320.
Poor Law Commissioners, 10, 17.
Price, Dr., 170.
Puerperal fever, 365.

Recreation spaces, 43, 60.
Reception houses, 22, 30, 58, 329, 330.
Refuse despatch works, 56.
Registration Act, 18.
Relapsing fever, 3, 22, 339.
Rental of houses in Glasgow, 98, 118, 124, 128, 154, 218, 232, 268.
Royal Infirmary, 16, 66.
Revaccination, 333.
Revaccination in lodging-houses, 334.

"Salvation Sal," 237.
Sanitary Department, growth of, 23 (note).
Sanitary Inspector, 23.
Sanitary Inspector, report for year 1886, 216.
Sanitary progress in Glasgow (statistical summary), 3, 19, 22, 55, 58.
Scarlet fever, 93, 344.
Scarlet fever and milk, 58, 346.
Sociological aspects of sanitation, 249, 259.
Small-pox, 19, 22, 329.
Smith, Dr. D., 10, 41.
Spencer, Herbert, 249-252.
Statistics, vital, 484 *et seq.*
    „ „ arguments for local, 491.
    „ „ of four groups of districts, 517.
    „ „ of the community of Glasgow, 519.
Steam, development of Glasgow due to, 278.
Strachan, Dr., 316.
Strang, Dr.; 12.
Sunlight, 164.
Sutherland, Dr., 12, 358.
Symons, J. C., Assistant Commissioner on Condition of Handloom Weavers, 7.
St. Mary's Roman Catholic School, outbreak of disease in, 375.
    Post-mortem examinations by Prof. Coats, 376.
    Symptoms, 379.
    Distribution in institution, 381.
    Condition of school, 387.
    Dr. Gairdner, Dr. Finlayson, and Dr. Gemmell on, 396.
    Similar outbreaks, 399.

Ticketed houses, 27, 160, 185, 206, 271, 277, 514.
Todd, Dr., on alcohol as a food, 445.
Tuberculosis, 366 *et seq.*, 529 *et seq.*
    Memorial from Glasgow Medico-Chirurgical Society, 529, 568.
    Bacillus, 531.
    Infection of, by sputum, 534.
    Infection of, by milk and flesh, 537.
    Infection of, general conditions, 538.
    Measures of control, 454.
    Notification, 547.
    Isolation, 547.
    Disinfection, 548.
    Popular instruction, 549.
    Foreign methods, 551 *et seq.*
    General hygiene in prevention of, 559.
    Summary of suggestions, 564.
    Meat, 58, 593, 598 *et seq.*
Tyndall, 592.
Typhus fever, 3, 19, 20, 22, 29, 81, 92, 326, 327.
Typhus fever, stimulation in, 444.

Ure, Mr. John, 18, 19.

Vaccination, 19, 265, 332.
    Tracing defaulters, 89.
    In relation to smallpox, 465.
    Act, 19, 89.

Wallace, Dr., 207.
Water supply, 3, 18, 19, 360.
Watson, Sir James, 24.
Watt, Dr., 341, 352.
Watt, James, 278.
Wynds, the, 6, 8, 10, 11, 12, 24, 170, 215, 260, 273.

GLASGOW: PRINTED AT THE UNIVERSITY PRESS BY ROBERT MACLEHOSE AND CO. LTD.

1935-1 ✓

14